

DEPARTMENT OF AGRICULTURE

MYSORE STATE

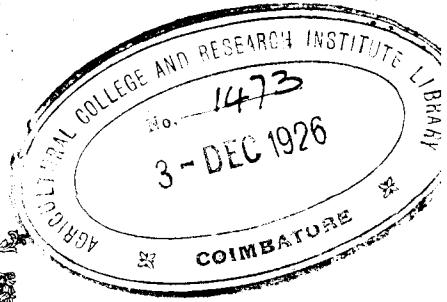
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# REPORT

ON

## THE PROGRESS OF AGRICULTURE IN MYSORE

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*G. H.*  
G. H. KRUMBIEGEL.

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# AGRICULTURE IN MYSORE

## P R E F A C E .

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The object of this Handbook is to give a rough outline of the work of the Agricultural Department since its inception ; while the present organisation as a Department was sanctioned in 1914 the period covering the activities which led up to the present organisation lies between 1900 and 1914 and this period is included so that the actual report covers the years from 1900 onward.

There have, however, been many interesting, though periodic, activities in Botanical, Horticultural and Agricultural work dating back as far as the latter part of the 18th century and which have influenced later work, so that for this reason and for historical completeness, I think it advisable to give a short account in this introductory chapter.

Both Hyder Ali and his son Tippoo Sultan did much to improve Agriculture and Horticulture. The development of the Amrut Mahal Breed of cattle, dates from that time. Sugar-cane was brought from the low countries and some of Tippoo's officers from Mauritius brought new varieties from that country.

Hyder Ali established the Lal-bagh at Bangalore and Tippoo greatly developed it. Fruit cultivation was encouraged and grafting practiced and some of the old mango trees are even to-day standing as witnesses of those days.

After the fall of Seringapatam, the Lal-bagh was placed in charge of the East India Company Botanist and many varieties of vegetable and fruits were introduced and grown.

In 1819, Major Waugh, in a memorial sent through Mr. Cole, the then Resident at Mysore, offered the Lal-bagh, as his garden, to the Government of Fort St. George. The Governor-General (the Honourable Marquis of Hastings) accepted the gift and after consultation with Dr. Wallich directed that the garden should be placed

under the administration of the Calcutta Botanic Garden and the maintenance be paid from Imperial funds.

In 1836, Sir Mark Cubbon started a Horticultural Society to whom His Highness the Maharaja Sir Krishna Raja Wodeyar III, made over the garden. The Society ceased, however, to exist in 1842 and the garden reverted to Government. In 1857, on the recommendation of Dr. Hugh Cleghorn, the garden was constituted as a Government Botanic garden and Mr. New was sent out from Kew as the first Superintendent. He brought out a number of Australian plants from Kew, and others were in the subsequent years, introduced. The large *Araucaria Eucalyptus*, *Grevillas*, *Dalbergias* and *Casuarinas* date from that time.

In 1862, an Italian gentleman Signor de Vicchy introduced a number of varieties of mulberry plants and some improved races of Japanese Silkworms, but the work seems to have been dropped as the disease then prevailing among the silk worms could not be eradicated.

Some attention was paid to the improvement of pasture and the introduction of Australian Rams by Sir Mark Cubbon but this was abandoned in 1862.

In 1869, the then Conservator of Forests Mr. Von Somerin did a good deal in the study of the indigenous Flora of Mysore and had published a booklet on the trees of Coorg. The Forest Department, as then constituted, was abolished as a separate department in 1873 and was attached to the then Agricultural Department, but was revived in 1895.

During that time an agricultural farm was opened under one Mr. Hermann very near to the present Sunkal Experimental Farm but was subsequently abandoned.

In 1874, after the death of Mr. New, Mr. Cameron was appointed as Superintendent of the Lal-bagh and with Mr. Rickets, who was then Conservator of Forests and also acted in Mr. Cameron's place during 1886-87, much useful work was done. The Hebbal Butts plantation was then established and many new trees introduced, such as, Rain tree, Ceara Rubber, Shingle tree, etc. Considerable work was done in the introduction and distribution of imported good varieties of potatoes and the kidney variety, now largely grown, still goes under the name of "Ricket". Mr. Cameron continued to be in charge of the Lal-bagh till his retirement in 1908. During his time a great amount of



useful economic work was done in the introduction and cultivation of fruits and vegetables, cottons, coffee grafting experiments, introduction of sisal hemp, etc., as also in the development of the ornamental side of the Lal-bagh. The area of the Botanic Garden was extended from about 50 acres to 100 acres which is the present area of the Lal-bagh, and a number of new parks were laid out. A large conservatory costing Rs. 75,000 was built in 1889 in Lal-bagh. Mr. Cameron also compiled a Catalogue of plants in the Botanic Garden and its vicinity. The preparation of the botanical drawings was started. A school for Apprentice Gardeners was opened.

In 1899, Dr. Lehmann was appointed as Agricultural Chemist and on his work (separately described) is based the formation of the present Agricultural Department.

With the appointment in 1908 of the undersigned as Economic Botanist and Superintendent, Government Gardens, the development of Horticulture and Economic work was organised on its present lines which is described in one of the following chapters.

In the following notes, the chapters dealing with the work of the different sections and allied departments have been written up by the officers in charge and the general compilation has been in the hands of the Deputy Director Mr. Yegnanarayana Iyer.

G. H. KRUMBIEGEL,  
*Offg. Director of Agriculture.*

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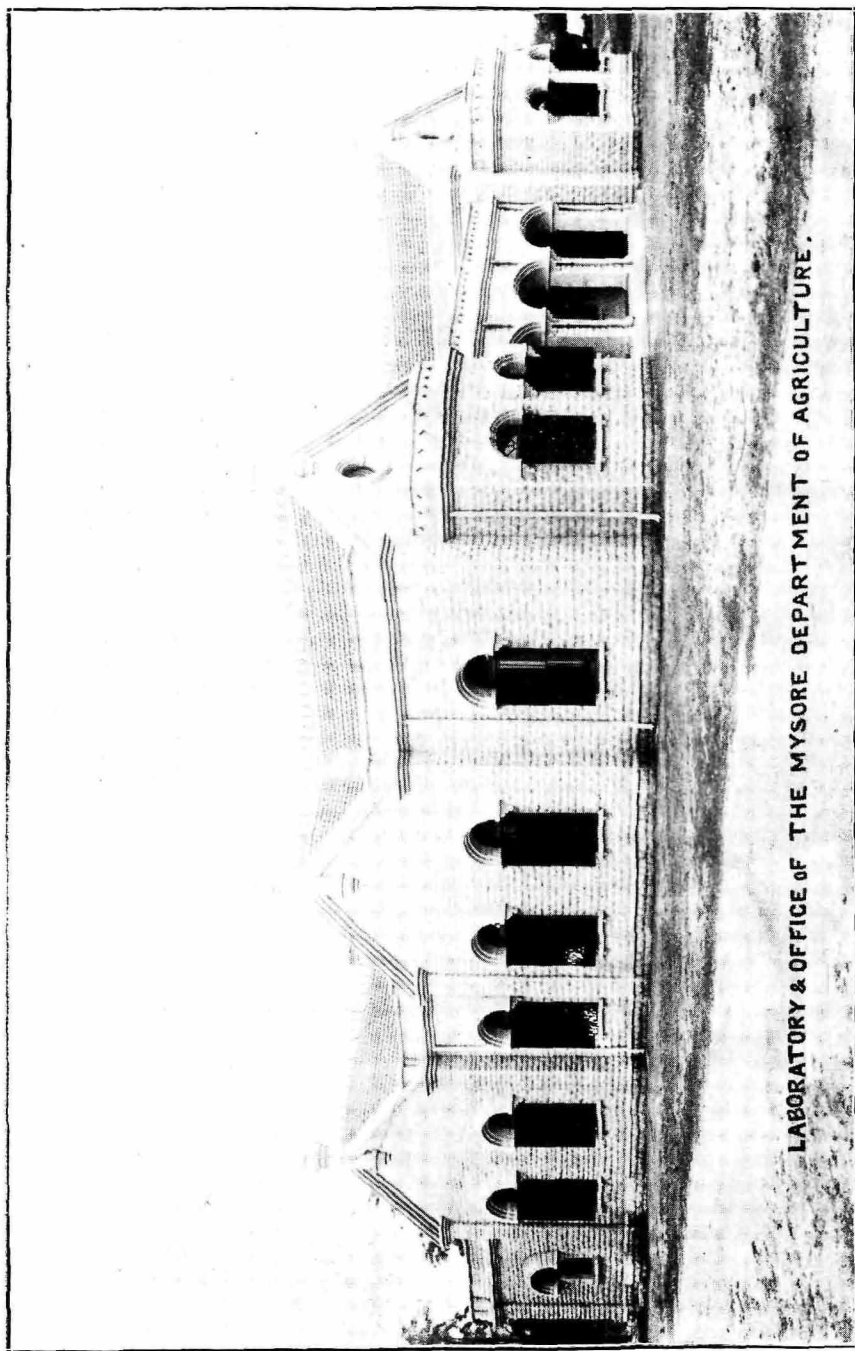
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LABORATORY & OFFICE OF THE MYSORE DEPARTMENT OF AGRICULTURE.

# AGRICULTURE IN MYSORE

## CHAPTER I.

### The Agricultural Features of Mysore.

#### A BRIEF DESCRIPTION.

The Mysore State comprises a tract of country lying between the  $11^{\circ} 38'$  and  $15^{\circ} 2'$  parallels of North latitude and between the  $74^{\circ} 42'$  and  $78^{\circ} 36'$  East longitude, comprising an area of 29,305 square miles or roughly equal in extent to Scotland. It is completely land-locked in nature having no seaboard or outlet to the sea. The Western Ghats with its outlying spurs form the western boundary dividing it from the coast districts of the Bombay and Madras Presidencies, the shortest distance to the sea being 10 miles. The Eastern Ghats comprised of broken chains of hills, enclose it on the East, dividing it from the plains of the Madras Presidency below. The country is thus a huge plateau lying between the two Ghats which, however, unite into the Nilgiri Hills in the south, forming the southern boundary of the State. The whole country slopes from west to east, and with the solitary exception of the Saravati River, all the large rivers which drain the country flow eastward. The plateau has a general elevation of 2,000 feet above sea-level. In general aspect, the country is exceedingly undulating, the western half of the State being very hilly with rugged and steep hill slopes, while the eastern half consists of extensive undulating plains alternating with wide valleys. The country may be said in this respect to be divided sharply into two zones, the hilly country to the west and the plain on the east, called respectively the *Malnad* and the *Maidan* with correspondingly sharp differences in their agricultural features.

The *climate* is mild throughout the year in marked contrast with that of the country below the plateau. In the Winter months of December and January, the mean temperature ranges from  $62^{\circ}$  in the western districts and the high altitudes to  $67^{\circ}$  in the eastern districts.

Summer temperatures seldom go above 100°, while the mean summer temperature ranges from 83° to 87°. Crop raising is possible throughout the year, the temperature never going down so low as to arrest growth. The mildness of the climate is indeed one of the marked features of the State, which allows of its being able to grow a variety of special crops to perfection which cannot be thought of in the plains.

The *rainfall* varies from a maximum of over 300 inches in the *Malnad* down to as low as 10 inches in some of the eastern taluks. The whole State may be divided into three zones in this regard: (1) the *Malnad* with its average rainfall of about 60 inches and attaining in certain places as high as 360 inches. The rainfall in this region is confined to the South-West Monsoon season, being practically concentrated in the months of June, July and August. The rains are torrential and incessant in these months and the maximum in 24 hours goes up to as high as 22 inches. (2) A zone with an average rainfall of about 30 inches may be taken as the general type of the *Maidan* or plain country, the portion lying west being more favoured by the South-West Monsoon, while the eastern tracts are favoured by the North-East Monsoon. (3) A zone of poor rainfall with an average of 17 inches comprises the taluks lying in the North-East. On the whole, the State may be said to have the benefit of both the South-West and the North-East Monsoons, the rains lasting, that is to say, from the middle of May to the middle of November.

The *predominant type of soils* in the State is a red loam, deep and uniform in character and free, easy working and responding well to good cultivation. Soils due to mixtures of sand, gravel and stones in varying proportions also cover extensive areas. The "black cotton" soils are also met with in large stretches in the Mysore, Chitaldrug and Kadur Districts. Rich clayey soils are general in the irrigated lands under most of the irrigation tanks. The soils of the western part of the State including those on the hill slopes and the plantations are highly lateritic and clayey. In chemical composition, the most notable feature is the high percentage of iron and aluminium. All the soil types are poor in nitrogen which ranges from '04 per cent to '15 per cent and poor likewise in phosphoric acid which ranges from '02 per cent to '10 per cent; they are all well provided in potash and lime, the black cotton soils being specially rich in the latter.

The *total area classified as fit for cultivation* is 8,699,808 acres, while the area actually under cultivation in 1924-25 was 6,268,131 acres. The total area under occupancy in 1924-25 was 8,009,794 acres, although only 6,268,131 acres was actually under cultivation. The percentage of culturable land which was left uncultivated is about 20 per cent.

The area still available for being taken up for cultivation was 690,014 acres which taken together with the 1,741,668 acres of occupied land left uncultivated is a measure of the improvement remaining to be effected in regard to the extension of cultivation.

The *size of the average holding* in Mysore is about  $6\frac{1}{2}$  acres. The total area under cultivation is classified as regards the size of holdings as below :—

Holdings	below	1 acre	...	...	93,412
Do	between	1 and 5	acres	...	481,238
Do	"	5 and 10	"	...	262,877
Do	"	10 and 50	"	...	196,475
Do	"	50 and 100	"	...	19,546
Do	"	100 and 500	"	...	2,780
Do	above	500	...	...	96

The bulk of the holdings are, moreover, composed of fields scattered and far removed from each other with all the disadvantages such a system implies. Both an increase in the average individual holding as well as a consolidation of the fields composing such holdings are very desirable improvements, though the difficulties of bringing about such a change are almost insuperable.

The cultivation in the State falls into three classes, *viz.*, (1) the *dry land cultivation* as distinguished from irrigated or wet cultivation. This is the predominant form of cultivation. Out of the total area of 6,268,131 acres actually cultivated, 5,240,881 acres or about 83·0 per cent, is under dry cultivation. The main food crops of the people, *viz.*, ragi and jola which afford at the same time the fodder for the raiyats' cattle, are raised as dry crops. Depending, as this cultivation does, solely upon the rainfall, it is subject to the chances of more or less failures. In addition to these main food crops, a number of inferior food grains and the whole of the pulse and oil seed crops are also grown only as dry crops.

(2) The "*wet*" cultivation or cultivation under irrigation.—The area under this method of cultivation is about 1,027,250 acres. Irrigation is certainly the most



important factor in crop production in the State, and provided water is given, there is no season of the year when crops cannot be raised to perfection in the State. Both to prevent crop failures and to obtain satisfactory yields, irrigation is all-important. From time immemorial, this has been realised, and the State possesses a most extensive system of irrigation works. All the large rivers and streams are dammed along their course and channels are drawn off for irrigation. The Cauvery river channels form the most extensive system of irrigation in the State. Throughout the State and especially in the Eastern Districts, irrigation tanks are numerous, so much so, that it may be said that practically every eligible site has been made use of for the purpose. Irrigation wells, both large and small, are also very important irrigation sources, especially in the north-eastern taluks with their low rainfall. Channels drawn off from the underground supplies in the rivers and spring heads also constitute a feature of the eastern taluks. Though much has been done by the State and the people, there is still scope for a great deal of work in the improvement of existing irrigation sources, the construction of new works and a great expansion of irrigation wells. The State at present possesses 946 miles of river channels, 24,826 irrigation tanks and some 40,464 irrigation wells.

(3) *Garden cultivation*.—Crops raised under well irrigation and gardens of perennial crops like the arecanut and the cocoanut under irrigation tanks or other sources are classed as garden or *bagayat* cultivation. These are very valuable properties and are generally protected by the provision of good irrigation wells in addition to the irrigation from tanks. The gardens are naturally in the possession of only well-to-do cultivators, and also pay a higher land tax than the other two classes of land.

*Implements of husbandry*.—The Mysore raiyat possesses a variety of agricultural implements appropriate to the different agricultural operations. All of them are, however, only small scale implements, are simple and inexpensive and are capable of easy repair locally. A variety of ploughs of different sizes, ingenious but simple, seed drills of different designs, blade hoes of different sizes and the *piccotah* and *kapile* water lifts are some of the most important.

The *plough* is the ordinary wooden plough which ploughs a V-shaped furrow. Many sizes, however, exist,

suited to different kinds of work. •Very light ploughs are used in paddy flats, a somewhat larger type is used for dry land, a heavier one still is used for the black cotton soil, while for special hot weather ploughing of this type of soils, a very heavy and massive plough requiring six pairs of bullocks is used. Blade hoes and harrows of many sizes are used for further preparation of the soil. Seed is sown by seed drills, of which there are many sizes and even varieties in design. *Interculture* has appropriate tools, both for bullock draught and for manual use. *Harvesting* is done only by the sickle, while *threshing* is done by hoary time-honoured methods, though these are being replaced rapidly by improved methods. Sugar-cane is crushed in small *iron mills* and the juice boiled in open pans over an open fire. Water is lifted by *piccotahs* of different shapes and sizes and by the *kapile* or bullock lift.

Nearly all these appliances, though they do more or less thorough work, are slow and wasteful of labour, and have to be replaced by labour-saving substitutes which will enable the farmer to handle a larger area. Already the improved plough, cultivator, cane mills, threshing rollers, and even pumps and engines are widely appreciated and in the following pages will be found details regarding the work actually accomplished in the popularisation of improvements in this respect.

*Crops.*—The State produces a great variety of crops, and the soils and climate and other physical features are such that there is hardly tropical crop of any importance which cannot be grown within the State. In the plains as well as in the *Malnad*, the most important irrigated food crop is rice; the most important dry crops are the grains ragi and jola, the pulses, *avare*, *thogari*, horse gram, Bengal gram, etc., the oil seeds castor, gingelly, groundnut and niger. Sugar-cane is the most important money crop under all sources of irrigation, while tobacco, chillies and a number of miscellaneous money crops are grown under well cultivation.

The arecanut, pepper, cardamoms and coffee are the peculiarly *Malnad* crops. The most important perennial crops of the plains are arecanut and cocoanut. Mulberry is one of the unique crops of the State and is grown especially in the Mysore, Bangalore and Kolar Districts where the silk industry is of great importance. The money crops tobacco and chillies are raised extensively as dry crops also, the former in the Mysore and Hassan

Districts, and the latter in almost all the *Maidan* Districts. Cotton, of which two varieties are grown, is of importance in the Chitaldrug and Mysore Districts, on the black cotton soils. The Dharwar American cotton, which unlike the local cotton grows in the red soils also is of considerable importance in the Chitaldrug and parts of the Shimoga, Kadur and Tumkur Districts. Plantations of fruit trees and trees of economic importance are also numerous in the *Maidan* districts, the most notable among them being the mango, casuarina, tamarind and *hongey*.

The *acreage under the most important crops* during the year 1924-25 is given in the following table:—

Chief crops	Acreage in 1924-25.	Chief crops	Acreage in 1924-25.
Paddy ..	696,391	Sugar-cane ..	32,029
Ragi ..	2,277,891	Cotton ..	119,287
Jola ..	627,234	Coffee ..	101,270
Horse gram ..	666,421	Arecanut ..	40,901
Togari ..	162,599	Tobacco ..	27,447
Gingelly ..	76,718	Mango ..	13,349
Groundnut ..	127,583	Cocoanut ..	127,170
Castor ..	130,062	Mulberry ..	30,505

The money value of the total crop production of the State in years of normal rainfall may be roughly estimated at some sixteen crores of rupees.

*Manures.*—The raiyats' chief and, in most places, the only manure known is *cattle manure* or sheep manure. The supplies of these available, is hopelessly inadequate to the needs of cultivation and the gradual reduction in the area available for grazing is bringing about a reduction in the number of cattle kept and consequently of the cattle manure available. The raiyats' cattle stalls have no good floor, the urine generally soaks in the ground, and except in the *Malnad* no litter is used. The manure itself is thrown in a loose heap subject to the action of sun and rain. There are notable exceptions here and there but the general practice is as described. Thus, even such cattle manure as can be had is being collected and preserved so carelessly that it is very poor in quality.

*Green manures* of different kinds, principally the leaves of the *hongey* trees are largely used in paddy cultivation, especially in the eastern districts where these trees abound, and where they are also raised as plantations for this

purpose. In the Channel areas of the Mysore District, many pulse crops are sown on the paddy lands to be eventually ploughed in as green manure. Elsewhere this practice is either not known at all or is not in vogue.

*Oil-cakes* of the *hongey*, castor and groundnut are being used as manure especially for sugar-cane in the Kolar and Bangalore Districts largely but the practice has now been introduced generally throughout the State by the efforts of the Agricultural Department in recent years. Lime is never used as a manure, its use as a manure being almost unknown. *Artificial manures* like sulphate of ammonia, bonemeal and superphosphate of lime, etc., are coming into use, due also to the work of the Agricultural Department. The natural manurial resources in the State are quite insufficient and unless the oil-cakes and other concentrated manures are used in conjunction with the local manures in a liberal measure, the crop yields will continue to be low.

*Live Stock.*—The Live Stock of the State comprises cattle, sheep and goats. Pigs are kept by wandering tribes, and poultry by nearly all farmers. *Oxen* are the only draught animals used both on the farm and for ordinary road transport. Cattle on the farm are kept for draught and other farm work such as, working the *kapile* lift, for dairy purposes and for producing manure. Mysore is the home of the finest draught cattle in South India and the Cattle Breeding Industry is a source of great wealth to the State. In fact, it is one of the main sources of income to the raiyats of the breeding and rearing tracts of the State. Highly priced cows are kept and served by specially selected bulls. There are, however, no large breeders who keep herds and make a business of the Cattle Breeding Industry, but the breeding is in the hands of ordinary raiyats who keep only a few head, about two or three, of breeding cows each. The male calves are largely sought after and secure very handsome prices. A large number of cattle fairs are held in the State in connection with the annual festivals at some of the famous temples and traders and raiyats from the Madras and Bombay Presidencies flock to these fairs to purchase cattle. As a fast trotting, highly spirited type, the "Amrut Mahal" breed is famous in South Indian history; the *hallikar* and the *Mahadeswarabetta* breeds are other highly famed Mysore types and are preferred for heavy farm and road haulage work. The industry is capable of

great expansion with profit to the State and the raiyat.

As a *dairy animal*, the cows of none of these breeds are of any special merit; all the cows are poor milkers and cow-keepers in the cities look as much to the male calves that may be born to these cows as to the milk, to make the milk vending trade pay. The *buffalo* is the special dairy animal, principally in view of its rich milk which furnishes all the butter and *ghee* of the trade. Except in towns, few or none keep any dairy herds and farmers generally keep only a few head of cattle of all kinds. It is noteworthy that for dairy purposes foreign breeds, either pure or cross-breds, are becoming increasingly popular among the dairy men in the cities. Buffaloes from Dharwar, Ahmedabad and Jafferabad are very much in evidence as well as cross-bred cows with Ayrshire, Jersey or Shorthorns blood in them.

The *cattle feed* consists of the dry straw of the cereal grains, of horse gram and cotton seed—this especially, to working cattle—of oil-cakes and bran for dairy animals particularly in the towns—and of ordinary grazing on the village grazing grounds. These latter are exceedingly poor as grazing grounds; it is only in the rainy season that some grazing can be had; in the summer, they are dry and parched and devoid of anything green except scrub jungle.

Except to a very small extent, no fodder crops as such are raised and no enclosed pastures or paddocks exist anywhere. The bulk of the cattle are very ill-cared for and any prolonged drought or delay in the springing of grass on the waste land spells ruin to them. Barring the stacking of dry straw, there is no other system of fodder storage. The years 1922 to 1924 were years of great fodder scarcity and cattle perished in thousands.

The sheep of the State which numbered about 2,500,000 in the last Census are of a decidedly superior type to what obtains on the plains of South India. They are, however, nowhere as compared with European or Australian sheep. The wool is coarse, the staple short and the fleece which is cut twice a year seldom weighs more than  $\frac{1}{2}$  lb. per clip. Except where a head or two is kept for household purposes, in general they depend mainly upon the scanty jungle growth or the stubble of the field crops for their feed. Their small size and the

general poverty of the feed they have to depend upon reduces their value as meat animals very much.

*Goats* are also kept in large numbers; it is not, however, the raiyat alone that keeps them but practically every villager keeps a few, except those who are forbidden by custom to do so. They are hardy and multiply rapidly; the unrestricted freedom they enjoy and the destruction they mean to cultivated crops, young plantations, avenue trees and really all manner of vegetation have given rise to frequent representations for some kind of restriction. Their hardy and prolific nature can be judged by the fact that, in the last fodder distress when the rest of the cattle population diminished by 50 per cent and in certain areas even 70 per cent, the goats *increased* by nearly 50 per cent. The goat is, however, the poor raiyat's wealth and adds materially to his slender income. The goat is looked upon solely as a meat animal, and neither good milch goats nor wool types exist in the State. These however, are very promising lines of improvement for being taken up.

*The raiyat's economic condition.*—The economic condition of the Mysore raiyat is certainly low, judged by even very ordinary standards. The vast majority of them even in the best of seasons, are only just able to carry on. The country being predominantly a dry farmed country, the vicissitudes of the seasons affect the raiyat profoundly. In an average season and on an average holding of the  $6\frac{1}{2}$  acres mentioned, it must be a hard struggle to wrest a living from the land. Assured sources of irrigation alone mitigate the situation but though in irrigated tracts, the condition of the raiyat may be somewhat different and existence may not be so hard, still even there the earnings will cover little more than the ordinary needs of the farmer. Having little or no reserve, the raiyat has invariably to resort to the money lender or to his wealthier brethren for loans in cash or kind to tide over the periods of want which are only too frequent. High rates of interest on money borrowed for working expenses or household expenses and the marketing of produce through the money lender himself help the farmer still further on the road to ruin and selling out. Even the larger landholders cannot be said to be in affluent circumstances by any means. Most of the valuable land, such as the wet lands and garden lands, are in the hands of people who either do not belong to the cultivating class or who have

given up the holding of the plough. If 80% of the total population of the State should be taken to depend materially on the land and the total value of the agricultural production at present is reckoned as eighteen crores of rupees, the earnings per head of the population per year works up to only about Rs. 35. Land in spite of its low return, still continues to be the sole form of investment for people who make money in other walks of life. The consequence is absentee land-lordism and cultivation by poor tenant farmers with all the evils well known in such an arrangement. The tenant is left with little more than wages for his labour, while the landlord complains that his own share barely amounts to even reasonable interest on his investment.

Moving in a vicious circle of cause and effect, the raiyats, both large and small, can be said to merely earn enough to maintain their present standard of living, and if additional forms of expenditure, such as the changing times demand should be thought of, they can be secured only through borrowing. As a matter of fact, even at present, the total indebtedness is appalling. The situation is that land is the sole wealth of the country and it has to maintain not only the tillers of the soil and the capitalist money lender and landlord, but all classes of people, and unless the land is made to produce a vast deal more than it is doing and the excessive burden on the land is relieved by new avenues to the employment of labour, the situation as regards the poverty and indebtedness will remain unchanged.

In what ways the former at least of these two solutions can be brought about, what measures of State action can be taken, what progress has been achieved by the Department of the State in these directions and what further action is proposed and should be taken up are narrated in the next chapter.

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## CHAPTER II.

**Lines of Improvement and Work Accomplished.**

In this chapter we shall discuss the broad lines along which the agriculture of the State admits of improvement so as to increase not only the actual production but also the money income of the raiyat. As regards the bulk and the nature of the work accomplished during the last fifteen years by the State Department of Agriculture and the departments allied to it, we shall deal only with the more noteworthy among them in this chapter, as a full account of each of these departments and sections appears in the succeeding chapters.

*Extension of Cultivation.*—“*Is all the land that is fit for cultivation actually under cultivation?*” may be asked as the very first question. The total area classed as fit for cultivation is about 87 lakhs of acres in the State and the area actually taken up for cultivation is about 80 lakhs of acres, leaving 7 lakhs of acres or about 8 per cent of the total area still to be taken up. What is more important is, however, that even of the 80 lakhs of acres which are under occupation only about 65 lakhs of acres are on the average, actually under cultivation every year so that a total of about 22 lakhs of acres or 25 per cent of the culturable area has still to be put up under crop. That gives us a measure of the improvement to be effected in this regard.

It may be added that a great extent of land on hill slopes or valleys fit for the raising of plantations of coffee, tea and rubber and land that can be set free from forest areas, from reserves of date groves or ‘Amrut Mahal’ kavals have not been taken into consideration at all. If those also should be taken into calculation then there are still vast stretches of land awaiting to be taken up for crop raising. In recent years, a great extent of waste land, some part of the Amrut Mahal kaval (pastures reserved for the Government cattle herds) lands and date groves have been thrown open for cultivation, but little more than the areas near to existing villages has been taken up. The rural population is averse to move out and migrate far.

It is also the case that with the present primitive small scale implements the limits of cultivation by the



available agricultural labour have almost been reached and an expansion of cultivation needs either a larger population or better implements. Remembering further that dry farming is mainly extensive farming, where the meagre and uncertain income per acre is too insufficient except when a large acreage is farmed, the State Department has tried to solve the problem by the introduction of better implements, especially the improved ploughs, for it is undoubted that with such a plough one can farm twice the area that can be farmed with the present country plough.

The *improved plough* popularised by the Agricultural Department is known as the Kolar Mission Plough, a small American-made plough imported by the Kolar Mission Institute and costing about Rs. 25. Other mould board ploughs, large and small, have also been introduced and the number in use in the State at the present time is close upon 15,000. When it is remembered that only about fifteen years ago the idea of the raiyat using iron ploughs costing even Rs. 15 was laughed at as a chimera, this rapid introduction of the improved plough is almost like a romance.

The department has devised and lately put on the market the '*Mysore Plough*' which has a bar-share arrangement with a view to reducing the cost of replacing the share which is a draw-back of the Kolar Mission Plough. The Kolar Mission Plough is largely copied locally and shares are made and repaired also. To that extent, the improved plough may be said to have become a permanent part of the agriculture of the State.

In addition to ploughs, what is known as the *six-shovel cultivator* is also sold in large numbers, a set comprising a Kolar Mission Plough and cultivator, being capable of handling two to three times the area that a country plough can.

Comparing equal areas, it may be said that in no part of India has the improved plough come into as large use as in the Mysore State and to the larger and larger use of such implements should one look for solving the problem of cultivating a larger area with the present agricultural labour. The work before us can be realised when it is noted that there are still about 830,000 country ploughs to be replaced by the improved ploughs.

In addition to the *extension* of arable farming by the introduction of the improved plough and other new

implements, there is the additional solution of the *planting up of the uncultivated land* with perennial plantation crops, that is to say, an extension of coffee and tea in the *malnad* and of the mango, cocoanut, tamarind and other economic crops in the *maidan*. The labour requirements are much less than for arable farming and the plantations add to the permanent assets of the country; to the large landholders especially who for lack of labour leave large stretches of land uncultivated plantations afford an admirable solution. Already this idea has been taken up and there is great activity displayed and the aspect of certain parts of the country completely changed as the result; but the room for expansion is very great and both stimulus and assistance by Government are called for.

*Is such land as is under cultivation producing the maximum crops that it ought to?* Most decidedly not; and it is here that there is room for practically unlimited improvement. The soils of the State are such that, provided there is an abundance of water for irrigation, the land will blossom as the rose. Irrigation is the most important factor in crop production in Mysore as it is in many other parts of India.

If the present irrigation tanks are improved, their feeder channels kept in order, the tanks themselves kept in better repair, the water in the tanks, when they do fill, better regulated in the distribution, if liberal encouragement is given to the digging of independent and subsidiary wells, if deeper underground water is arranged to be tapped and efficient pumps and engines provided for these deep wells, if all the water in the rivers of Mysore can be harnessed to the use of Mysore Agriculture either by channel irrigation or by pumping machinery within the water rights appertaining to the State, the gain to the wealth of the State will be incalculable. When it is remembered that ordinary dry land hardly worth Rs. 50 an acre appreciates in value to Rs. 1,000 an acre when irrigation water is assured to it throughout the year, an idea may be had of the benefits of irrigation and the increased production from the land.

What has the State done in recent years? Action has been taken on all these lines. Two of the finest irrigation works, the Krishnarajasagara and the Vani Vilasa Sagara are monuments to the beneficent action of the State. Between these two a very large tract of country will be brought under irrigation.

In other directions also something has been attempted; *takavi* loans are granted for *well sinking*; *pumps and engines* are sold on the hire purchase system; large pumping installations on river margins have been encouraged, cheap electric power is furnished along the electric power lines, Tank Panchayats are constituted to regulate distribution of tank water; and a well-boring staff with suitable equipment has recently been constituted. Nevertheless only a beginning can be said to have been made and the ground to be covered is vast.

The second important factor, keeping down the yields of crops, be they on the dry lands or the wet or garden lands, is the *lack of sufficient manure*. With adequate manuring the yields of most crops can be increased twice, if not, threefold. One has only to glance through the figures giving the average yields of the different crops in the State and compare them with the yields on well-manured areas to realise the magnitude of the increase possible. The good yields even now obtained by careful agriculturists and the average State yields are put down side by side to indicate the possibilities :—

		<i>Average.</i>	<i>Good yields.</i>	<i>Very good yields.</i>
Paddy	...	8 pallas	20 pallas	30 pallas
Ragi	...	4 pallas	8 pallas	12 pallas
Sugar-cane	...	100 mds. of Jaggery	300 mds.	500 mds.
Arecanut	...	15 mds.	30 mds.	60 mds.

It is in this branch of work that the efforts of the Agricultural Department have borne most gratifying fruit. Numerous demonstrations have been held on raiyats' holdings to demonstrate the effect of manuring with concentrated fertilisers, and with the co-operation of many farmers, both large and small, good manuring has been extensively popularised.

A great part of the output of *oil-cake* of the local oil mills in the State is being locally absorbed. The sale of *superphosphate of lime*, of *sulphate of ammonia*, of bonemeal, sulphate of potash singly and in mixtures according to the recommendations of the Department, run now into hundreds of tons. During the season 1924-25 alone, the total sales went up to over 335 tons. What is more encouraging is that technical advice is largely resorted to by raiyats for manuring not only valuable crops like sugar-cane or paddy or potatoes but also ragi, ground-nuts and other dry land crops for many of which the

Department puts up special mixtures tested on the Government Farms. The sales are growing to such a magnitude as to be taken up by regular dealers, setting thereby the Department free for the really technical part of the work of experiment, advice and supervision.

The cheap forms of manuring are by no means neglected. The practice of *raising green manure crops* is being widely popularised in places where it is not known. The raising of *Honge plantations* is encouraged by special concessions in particular areas.

Gratifying as these results may be, compared with what remains to be done, they amount to very little, for the ground to be covered is again immense.

It may be also mentioned that within the last ten years about half a dozen *Oil Pressing Factories* have been started in the State to utilise at least a portion of the rapidly growing oil seed production. Rotary mills, screw presses and "Anderson Oil expellers" exist in both Bangalore and Mysore; while in Tumkur, a factory was built for the extraction of oil by means of chemical solvents like Benzene. As thus the production of oil-cake increases, the local demand is made to keep pace with the supply through the agency of the Agricultural Department.

A scheme for the *manufacture of calcium cyanamide* at the Krishnarajasagara, where special provision has been made for the generation of electric power, has been considered and a good amount of preliminary investigation conducted. The question of the manufacture of sulphate of ammonia also by the fixation of atmospheric nitrogen is worthy of being taken up. The growing popularity of sulphate of ammonia indicates the responsiveness of the raiyat, and the vast scope and crying need there is for the use of the manure coupled with the cheap and abundant electric power in the State, afford all the justification necessary for the starting of such manufacture.

Next to irrigation and manures comes the *cultivation of higher yielding varieties as a factor in increased production*. The isolation and testing of pure strains and the multiplication of the best among them, the evolution of altogether new and improved varieties or strains by well known methods of plant-breeding and later the large scale trials on raiyats' holdings and then their introduction into general cultivation, have received a great deal of attention and the efforts of the Department have been attended with marked success. *Ragi*, the staple food crop of the people and

the most widely cultivated crop in the State has been taken up first and more than one pure and higher yielding strain evolved and put out. The "H 22" has been the most notable of these; it has been taken up most extensively, the area now reaching more than 100,000 acres. In many a village the old varieties have given place almost entirely to the new strain. An increased yield of about 20 to 30 per cent over the local mixed strains can be claimed for the new strain, and the increased production due to this one variety alone can be readily appreciated. A new strain of cotton selection is another important item evolved by the Department; with a ginning percentage of 28, of good white colour and a level staple with good strength, the variety is a great improvement over the local "Sannahatti." The cotton growers have appreciated its superiority and during the year 1925-26 alone, an area of 15,000 acres has been sown with this particular strain. Other lines of improvement in respect of cotton are also in progress.

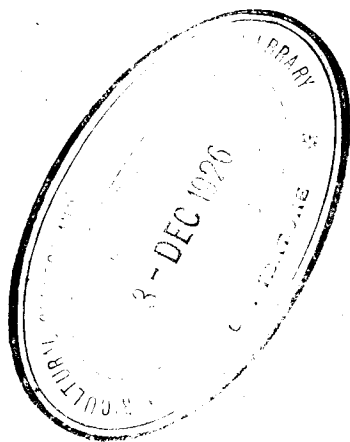
Another notable achievement is the evolution of *some excellent new varieties of seedling sugar-canes*. The H.M. 544, H.M. 320, H.M. 553 and several other cane varieties which are now rapidly being introduced into general cultivation have all been evolved by the Department. With paddy, groundnuts, castor and coffee a beginning is already made but the problems have to be restricted in number according to the staff available.

The *work of evolving superior varieties* is becoming the most popular line of work in all Departments of Agriculture and deservedly so; in Mysore we are only just beginning and though already very marked success has crowned our efforts, still the scope before us is vast and will require the sustained labours of a well equipped staff for as long as we may care to think of. One has only to look at the long list of the important crops of the State and consider that what has been done for ragi, sugar-cane and cotton will have to be done for each one of them. Even with these three crops there is nothing like finality, there is always the matter of something better, and that of even new and choice varieties becoming 'played out.'

These remarks need not be confined to the field crops alone; there are the Horticultural crops, the flower, fruit and vegetable crops and the plantation crops like coffee and the cocoanut. Similar work will have to be taken



THE KRISHNARAJA SAGARA,—VIEW OF THE KAVERI RIVER IN HIGH FLOOD AND FLOWING  
OVER THE GAP.



up in regard to these crops also. If what has been accomplished can be taken as an indication of the possibilities of the future, there is no reason why production should not be increased by at least some 50 per cent by this one agency alone.

Though not coming strictly within the scope of plant breeding work, the distribution of *short duration or early maturing varieties* of various crops, and of the transfer of superior varieties to places where they may not be known, is also a factor of increased production in as much as often two crops are possible to be raised where only one was being grown in the season, and that furthermore, crops are made possible with supplies of water which with the ordinary varieties would not suffice to mature a crop. The short duration erect varieties of *groundnuts* called Spanish and Small Japan, illustrate the first point and the *early maturing paddies Banku, Kapilesanna, Chintamanisanna and Halubbalu* illustrate the second. These new varieties of groundnuts now occupy whole taluks in the Chitaldrug and Mysore districts and the paddies are being distributed in yearly increasing quantities; about 200 pallas of seed-paddy are supplied yearly by the Department, the groundnut, itself having become an article of the Seed trade, and now, in the hands of regular suppliers.

The matter of increased crop production by direct methods described above, is closely connected with the *reduction of losses due to crop pests and diseases*. These inhibitory causes account for the reduction of crop yields to an extent which is seldom realised, because the raiyat feels helpless and puts it all down to the inevitable decree of Fate. There is not a single crop in the State on which pests and diseases do not take a heavy toll, and the loss in the aggregate even in good years is stupendous. Ragi, the staple food crop, which fortunately is the one crop which is singularly free, is still subject to the ravages of the *Kamblihula* at the young stage, and later the grain is subject to smut. Jola is the exact reverse of ragi being subject to pests and diseases from start to finish. The *kamblihula* wipes it out in its young stages, and the grasshopper is a periodical visitor. Grain is subject to smut and is preyed upon and ruined by the jola fly; in storage again, the grain is attacked by weevils. The pulses are damaged by pod eating insect pests and latter, in storage are seriously damaged by weevils. Sugarcane is damaged



by the borer in all stages of its growth. The cotton is subject to the boll weevil, stem-borers, aphids and so on which reduce the yield and the quantity of the cotton seriously. Castor is often wiped out by the leaf-eating semilooper.

Paddy is subject to the caseworm, stemborers and to fungus diseases. The potato, tobacco, and chillies, all valuable crops, likewise suffer. The arecanut is subject to the "*Kole roga*" "*anabe*" and other fungus diseases while the cocoanut is subject to the ravage of the beetle and to "stem bleeding" and other fungus diseases. The coffee with its "black rot," stem borer and scale insects also suffers serious loss. Sandal constituting the unique forest wealth of Mysore is threatened with extinction by the 'Spike disease'. The fruits and vegetables have each their enemies which often work absolute ruin. A successful combating of these pests and diseases will mean, in many cases, the saving of the whole crop from destruction while in other cases, very material reduction of the loss.

Unfortunately, almost every one of these pests and diseases requires prolonged and patient investigation by well-trained and highly qualified men before any reliable remedy, lying within the means and resources of the poor raiyat, can be recommended. Nevertheless, the Department has already a splendid record of achievements in this direction, which has meant material relief if not actual saving of the crops from wholesale destruction.

The *remedy for the 'Kole Roga' of the arecanut* for which the Mysore Agricultural Department was the first to devise a remedy and adopt it with success, forms really a splendid achievement. It has meant the salvation of the *malnad* garden-owner. It has been taken up by the bordering British district *malnad* areca tracts, who also thus share in the beneficial results of the work of the Mysore Department. When it is noted that there are at present 2,300 sprayers in use owned by the garden owners of the *malnad*, it may be realised to what extent and how cheerfully the garden owners themselves have adopted the recommendations of the Department.

On the *Entomological side many a cheap and inexpensive remedy* has already been devised and put into the hands of the raiyat. The '*kumblihula*' campaign is the most notable; the raiyat has taken readily to this simple remedial measure and many a large tract in Shimoga,

Chitaldrug and Kolar where the pest was working havoc have not only been cleared but the raiyats have been educated to know and to do what should be done when they are faced with an invasion by the pest. The caseworm of paddy, the sugarcane borer, the pulse beetles, and the coffee borer have also been handled successfully.

Both in the case of the *kole roga* and the *kamblihula* pest, the aid of Legislation has also been sought and the Pest Acts of Mysore in relation to both these are on the Statute Book and in operation. Were it only possible to deal satisfactorily with even a few of the more serious pests, a most material addition to production in the State can be assured. To take only one instance *viz.*, the cotton weevil, in field upon field, it will be noted that not a single boll is free, sometimes one, sometimes all the four capsules will be attacked, the former resulting in shrunken and only half-opened bolls and the latter, in unopened bolls. A cheap and satisfactory remedy means the increase in the yields by at least 50 per cent. It will be easy to give similar figures in respect of other crops, but the point hardly needs labouring.

*Increased money return to the raiyat. Does the Mysore raiyat use such methods of cultivation and methods of preparing produce and grow such crops as will give him the highest money return to his labour?* This may now be considered. This question relates firstly, to the best methods of preparing produce, such as sugarcane into jaggery, of the curing of tobacco, the curing of areca, coffee and cardamom, the preparation of butter and other dairy products; and secondly, the adoption of cultivation methods by which the expenses may be reduced without affecting the yield; and thirdly the growing of money-crops in order to give the raiyat the best money return for his labour and investment.

In every one of the methods of preparing produce indicated, there is such a difference between good and poor methods that the advantage of having raised a big crop at great expense may be completely neutralised by poor methods of manufacture. Especially in the case of sugarcane, the full advantage of a heavy crop is seldom realised; poor and inefficient mills are used, indifferent methods of boiling the juice are adopted over furnaces exceedingly wasteful of fuel, with the result that sometimes the jaggery does not set at all, or sets into a black and soft mass of low value. In the curing of tobacco too,

while good methods turn the crop into the best priced commodity, poor methods convert the stuff into an article fit only for manure. Similar remarks apply to the other crops mentioned.

As regards the sugarcane, though the present iron-mills are a great improvement upon the old wooden mills which have altogether gone out of use, they are not the best by any means even as bullock-driven mills go, while compared with even small power-driven mills, they are a long way behind. At present, only about 55 to 60 per cent of the juice is extracted; 60 to 65 per cent is easy with better bullock-mills, and 75 per cent likewise with small power-driven mills.

The Department is popularising the "*Nahan*" *sugarcane mill* which is a *better bullock-mill* than the local ones, and through extensive village demonstrations has succeeded in making it a very popular one. About 400 of the type are now in use in the state, imported and sold through the Department of Agriculture. Of late, however, mills of the same type are being manufactured by local foundrymen with certain other improved features; so that as far as the introduction of a mill is concerned, the efforts of the Department have been entirely successful. Installation of power-driven mills and large scale furnaces can be seen in the State in a few places on the larger holdings, but expansion here must be slow as it is dependent upon the growth of co-operative methods. The jaggery boiling work is on the whole an operation in which the aid of the Department is frequently sought, and very material assistance is rendered.

In the areca tract, an *imported areca drying apparatus* and an adaptation of the same with local materials has greatly minimised the chances of deterioration of the produce and has rendered the drying practically independent of the vagaries of weather conditions. In the *methods of butter making* again local methods have been attempted to be replaced by the use of a cream separator and the barrel churn and in the first years of the campaign, several such outfits were sold through the Department.

*Changes in cultivation methods* proper are about the most difficult to introduce, but even here, practices such as economic transplanting of paddy and the planting of sugarcane in wider rows have been extensively adopted, with a very material reduction in the cost of seed and with an increased yield per acre also.



FIELD DAY OF THE AGRICULTURAL AND EXPERIMENTAL UNION ON THE  
HERBAL FARM,—VIEW SHOWING MEMBERS INSPECTING THE  
FLOCK OF CROSS-BRED SHEEP (MERINO X LOCAL).

The *extension in the area under money crops*, both dry crops and irrigated crops, not only enhances the money returns to the raiyats, but also paves the way for the investment of funds whether from Government or private agencies upon irrigation schemes which otherwise would be considered unremunerative. Among irrigated money-crops, sugarcane and the mulberry rank foremost. The Department has, from the beginning been engaged in the *extension of the cultivation of the sugarcane crop*, distributing seed far and wide, establishing seed centres, excusing transport charges on seed sets, awarding money-prizes, and so on, and thus introducing the cultivation in all eligible tracts, notably in the *Malnad*. With the extension of irrigation facilities, the area is bound to increase still further.

The *mulberry* is Mysore's unique and valuable money-crop, and as a subsidiary occupation, the rearing of the silk-worm is a most important and lucrative industry. By methods much like those detailed above for sugarcane, the area is being steadily increased; a special section of the Department looks after the interests of Sericulture; improvements in rearing and reeling methods, the evolution of new strains of worms, methods of combating disease in the worms and other matters are receiving attention. The supply of disease-free eggs on a large scale from Government grainages and farms, the designing of a domestic filature unit and the evolution of a cross-bred type of worm which yields a larger quantity of silk and also matures earlier than the local worm, may be mentioned as work accomplished so far. A very comprehensive account of the progress of Sericulture in Mysore will be found in chapter VIII.

A most notable money-crop in recent years is the *groundnut* which, from being a completely insignificant crop about 15 years ago, is now grown over an area of 150,000 acres and is still on the increase.

For the extension in the cultivation of these and a number of other money-crops including fruits, flowers and vegetables, we shall have to look to a larger and larger amount of propaganda work, technical advice, demonstration areas and other activities of the Agricultural Department. There need be no fear of Mysore not growing enough food, because the money-crops are stimulated; for even were food crop areas greatly curtailed, the same quantity of produce may still be raised by improved

methods of cultivation with better varieties and liberal manuring. The State has wonderful advantages in climate, soil, facilities of irrigation, knowledge of the technique of cultivation and a State Department composed of specialists and it will not be wisdom if these are not taken advantage of to raise the most paying crops.

Closely allied to this subject is that of the *growing of fruits, flowers and vegetables* not so much as field crops as of garden patches *and as a subsidiary occupation*. There is great scope for this side of Agriculture to be developed. If every backyard in the 17,000 and odd villages of the Mysore State should have one good fruit bearing tree, a grape vine or a fig tree, a few papaya or even a few plantain trees, kept alive merely from the sullage of the houses, the State would produce fruits enough not only to sweeten the coarse and poor diet of the ordinary villager, but even to have a surplus for export; and yet this is by no means impossible or difficult. Nurseries at convenient centres or at least on the Government Farms, an agency to supply the proper plants, to supervise and advise regarding manuring, pruning, and other technical matters will have to be organised if this object is to be secured within a reasonable period of time. Through the Department of Horticulture and Gardens, a beginning has already been made, much interest has been aroused in the planting of grapes and apples, mostly imported from Australia. A number of orchards have, in recent years, been started and the examples of the older ones among them which are paying handsomely is acting as a stimulus and an object lesson in and about Bangalore especially. Some thousands of plants are now beginning to be imported and supplied by this Department every year regularly. The State, in addition, grants special loans at a low rate of interest to those who propose to start such orchards; and applications for the grant of land for the purpose are also viewed favourably.

A most important *subsidiary occupation* which adds materially to the labour income of the raiyat is the *breeding of sheep and cattle*. It has already been pointed out that the climate, situation and other physical features of the State coupled with its tradition as a great cattle centre, give Mysore a most valuable advantage over the rest of South India. It may be further added that it will be generally found in the villages that only such raiyats as annually rear and sell a head or two of cattle,

a few sheep or at the weekly fairs some poultry and eggs, are those that command some ready money. Furthermore, the question of improved implements and the farming of larger areas with fewer men is intimately bound up with an improvement in the type of the farm bullocks. The State, no doubt, possesses the finest breeds of cattle in South India, but efforts have to be made to see that the number of these is so increased that every raiyat can afford such plough bullocks and that in time the scrub cattle of the countryside gives place entirely to the celebrated Mysore type. A large and steady supply of breeding bulls, readily available at reasonable prices to the villagers, will automatically bring about the desired change. The Amrut Mahal or Government herd could, without great difficulty, be improved and expanded to meet the requirements of the situation.

Connected with the supply of breeding bulls is the *question of fodder supply* in the villages. Without an adequate supply of fodder, especially in the hot weather, we should never be able to sustain the progress of cattle improvement. Probably dire necessity, consequent on the shrinkage of the grazing area before the advance of cultivation, will force raiyats not only to reduce their scrub cattle but also to raise fodder crops. That, however, will take a long time to come. Meanwhile, enclosed fodder reserves, the raising of fodder crops and the system of ensilage, making as a reserve of cattle feed that does not admit of being sold away or damaged by fire, will have to be encouraged by special measures.

The cattle breeding industry has, from time immemorial, been heavily handicapped by the *prevalence of serious cattle diseases*. The Rinderpest is the most serious of these, and, as a calamitous epidemic, is of frequent and widespread occurrence. The losses due to mortality are enormous. Other diseases also take a heavy toll and one of the most important lines of State-action lies along proper preventive measures against these epidemics. In the "serum simultaneous" method of inoculation against the Rinderpest a satisfactory solution of this one problem at least is to hand and the Veterinary Department of the State has begun an extended campaign of preventive work along this line, as many as 40,000 animals having been protected by this method in the year 1924-25 alone. In the suppression of this, as well as other cattle diseases, will

lie to a large measure the prosperity of this important industry of the State.

The *improvement of local sheep* has been attempted more than once by the Government. In the old days, Sir Mark Cubbon had a Government Sheep Farm on which local ewes were crossed with imported Merino rams. This Farm was later wound up. Cross-bred sheep are so vastly superior to their local parents that the improvement should be considered very material. Thus in regard to wool alone, first crosses gave 150 per cent over the country parent per year, while the quality was very much superior. When it is remembered that such improvement is the work of less than a couple of years, it will be realised how readily the sheep-breeding industry lends itself to improvement. Government, at present, maintains a small Sheep Farm, but the number of cross-bred rams it is able to supply is negligible. A small organisation of Sheep Breeders has also been started to work in conjunction with the Farm. But a great expansion is called for more especially as the prospects of gain, both to the raiyat and the State, are not only substantial but almost immediate.

Experiment, in the introduction of *wool-goats such as the Angora*, for crossing with local breeds is also worth considering, in view of what has been said about the hardness of the goat in the country. A great stimulus in fact to the whole Live Stock Industry in the State, to the cattle, sheep, goats and even poultry is earnestly to be desired.

We next come to the *safeguarding of the raiyats' efforts and earnings against exploitation*, to his being helped to obtain the working capital for his business at reasonable rates of interest, to his being able to buy and sell without paying anything more than reasonable charges for the services rendered, because the drawbacks that at present exist take away from the raiyat, in a great measure, much of the profits of his labour and cripples him seriously. State-action in Mysore for affording credit to the agriculturist was set on foot in the year 1895 and it took the form of *Agricultural Banks* to which Government advanced loans to the extent of about 15 lakhs of rupees. Due to various causes, most of these Banks had to be wound up, though a few lingered on for many years. Meanwhile, the *Co-operative Credit movement* took its place and the State fell into line with the British Indian

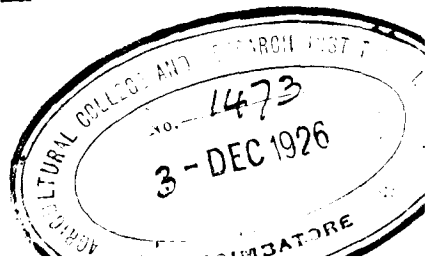


Provinces in this respect and work has been carried on much on the same lines, and perhaps with results practically similar. Societies in the State are all only banking societies, but, without detracting from the value of the movement, it must be said that the relief afforded to the actual cultivator is very little. The chief reason is the vast disparity between the huge indebtedness of the people and the slender finances of the societies. An agency for affording working capital to the raiyat for the purchase of seeds and manures, bullocks, etc., at easy interest and for the length of a crop season or more in case of crop failure is a crying need.

Co-operative Societies for purely agricultural purposes such as Irrigation Societies, Jaggory Boiling Societies, Produce Selling Societies, etc., have now and again been started, but nearly all these societies have had to be abandoned, although with a little more persistence, success may have been obtained with some of them at least.

The only noteworthy manner in which Co-operative societies have been associated with the Agricultural Department is in these societies taking up the sale of improved implements, seeds and manures, in the joint owning of cane-crushing mills and jaggory-boiling pans. About 200 Societies have taken up this work. For a development of really Agricultural Co-operative societies, for the ownership of large-scale appliances, for the carrying on of joint purchase and sale of produce, etc., a special agency is essential.

Having thus indicated the lines along which Mysore Agriculture can be improved, we shall, in the next chapter, take up a description of the various agencies which are engaged in bringing about these results, their organisation, equipment, nature of work taken up and accomplished and their programme.



## CHAPTER III.

**The Department of Agriculture and Allied Agencies.**

The Mysore Department of Agriculture had its beginning in the appointment of an Agricultural Chemist in the year 1899. This was in conformity with the ideas of scientific agriculture prevalent in those days and especially with the recommendations which were made to the Government of India by Dr. Voelcker for the improvement of Indian Agriculture. The Officer selected for that appointment was Dr. Lehmann, M.A., B.S.A., Ph.D. The present laboratories and pot culture house were designed and fitted up by him and the Hebbal Farm was also opened and laid out by him. He was also entrusted with the supervision of the chemical work of the Geological Department, the chemical assistants of that Department were placed under him and so was the laboratory of that Department which was the nucleus of the present buildings. An assistant for agricultural chemistry was later appointed and the staff of agricultural chemical assistants was later added to. It had however to be urged on the Government what indeed was realised from the beginning that the problems of Mysore agriculture were too complex for an agricultural chemist alone and that as a measure of immediate importance the services of a specialist in plant diseases should be secured. Accordingly in 1903 Dr. Leslie C. Coleman was appointed as Entomologist and Mycologist, with competent Indian Assistants. The Marthur Farm was opened during the period for experimental work on the "Koleroga" of the arecanut for which the present successful remedy was evolved. The term of engagement of Dr. Lehmann's services expired in 1908 and he severed his connection with the Department. In accuracy and thoroughness of work, in extreme caution in the drawing of conclusions, and in the scientific planning of the laboratory and field experiments with a view to arriving at results of undoubted reliability, Dr. Lehmann has left an indelible mark on the work and tradition of the Department. On Dr. Lehmann's retirement, two of the assistants were sent to Europe for advanced training, and this policy, inaugurated then, has been steadily followed so that at the present time among the Departmental Officers, the Deputy Director of Agriculture,

the four heads of the scientific sections and two of the Senior Officers of the Sericultural Section have all received training in Europe, America or Japan.

It was only in the year 1914, that the Department was reorganised in something like its present form with Dr. Coleman as Director of Agriculture. It was at this time that a section for what is known as District Work, *i.e.*, for advice and popularisation of improvements among raiyats was constituted, the State being divided into two divisions and placed under the charge of a Deputy Director and an Assistant Director with a small staff of Agricultural Inspectors. From this time onwards both the work, staff and equipment have steadily expanded. An Assistant Botanist, for work on plant breeding, was appointed in 1914 and this section has grown and achieved notable results. The Babbur Farm was opened in the year 1916 to serve the extensive black cotton soil tract of that part of the State and at the same time to serve the tract newly brought under irrigation under the Vani Vilas Sagara. The Nagenahalli Farm in the Mysore District, for the trial and multiplication of varieties of sugarcane for the extensive channel irrigated area of that District, was opened in the year 1917.

An Agricultural Engineer was appointed in 1915 as a nucleus for the Agricultural Engineering Section. The School of Agriculture at Hebbal was opened in 1913 as an institution giving a two years' course, and was later on in the year 1920 reorganised and the course made into one of three years. Due to a private benefaction, a Vernacular Agricultural School giving a one year's course was opened in the year 1916 in the village of Chikkanahalli in the Tumkur District.

In the year 1920, a Live Stock Section was created and Mr. Davison was appointed Live Stock Expert. A Sheep Farm was also opened at Yelachihalli in the Mysore District. Mr. Davison, however, resigned his appointment in 1925. In the year 1920 the Department of Sericulture was placed under the control of the Director of Agriculture and so was the Civil Veterinary Department. In 1923, the Amrut Mahal Department was also transferred to the control of the Director of Agriculture.

In the year 1924, a well-boring section was organised and placed under the Director of Agriculture. The Section was later transferred to the control of the Director of Industries and Commerce.

The present composition of the Department of Agriculture in all its different Sections is given in appendix 2.

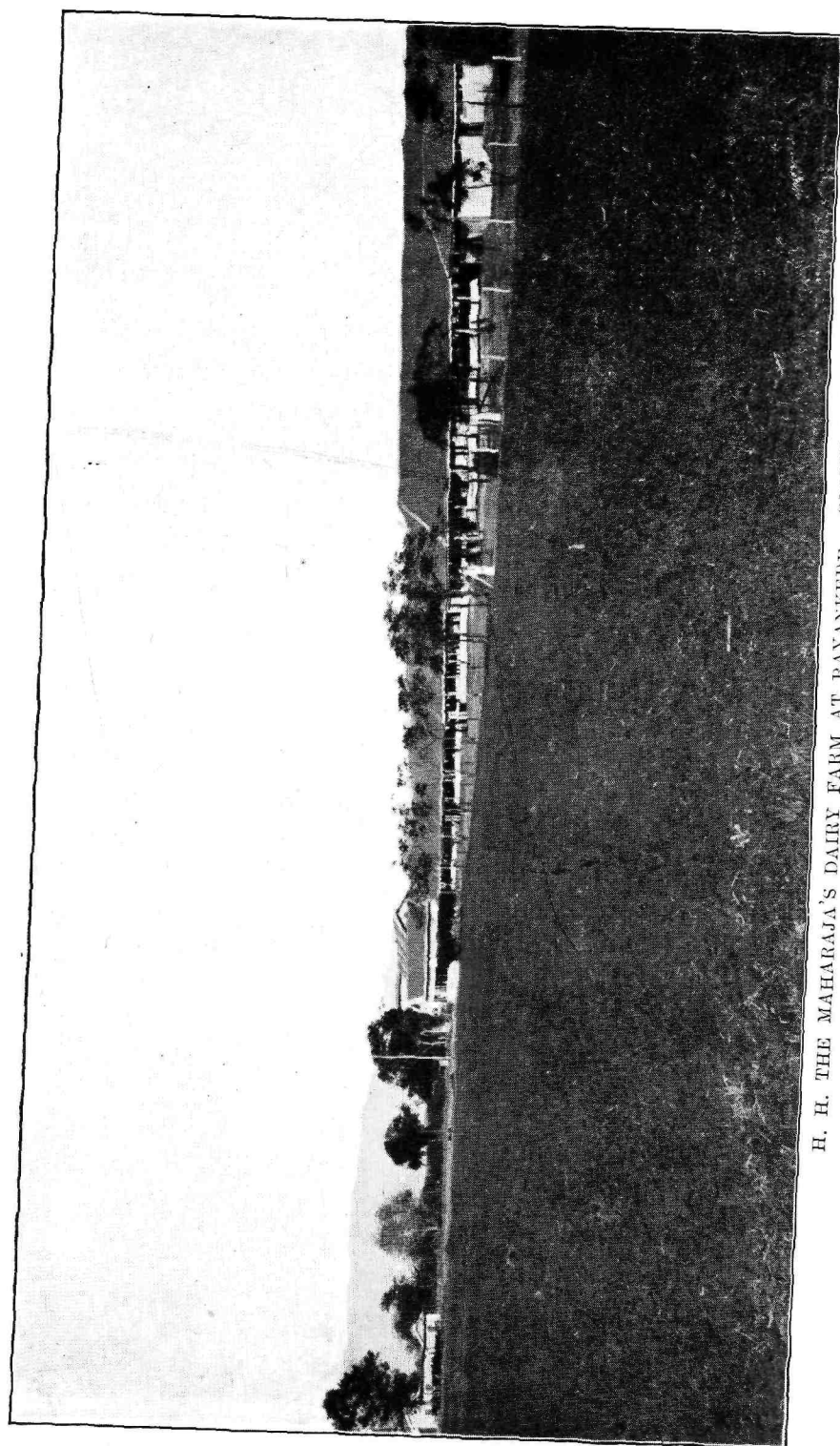
Reference should be made to the *Board of Agriculture*, a deliberative body comprised of selected officers of the Government and of non-official gentlemen, representatives of important agricultural interests and charged with the work of considering and suggesting measures suitable for action towards the improvement of agriculture and rural life in all its aspects.

The *Department of Horticulture and Gardens*, although closely allied to the Agricultural Department, is an independent Department under the control of a Superintendent. The organisation and the work of this Department are separately dealt with.

The *Department of Co-operative Societies* was constituted in the year 1905 and has since steadily grown. As far as agriculture is concerned, a Sub-Assistant Registrar of Co-operative Societies is, in addition to other duties, entrusted with the duty of developing agricultural co-operation. Likewise, for the development of Sericultural Co-operation, a separate Senior Sericultural Inspector has been appointed. The work of this Department in respect of agricultural co-operation is also dealt with separately.

Mention should be made of the *Agricultural and Experimental Union*, which was started in the year 1918. The Union is composed of members who are actually in charge of the cultivation of their land in strong contrast to the type of agricultural associations which were started in various parts of India, not excluding Mysore itself, and none of which led anything but a nominal existence. The Agricultural and Experimental Union of Mysore forms a link between scientific investigation and general agricultural practice. The new methods, new manures, new varieties of crop, etc., recommended by the Department, are first tested on trial plots on the holdings of the members about as accurately as on the Government Farms and on the successful results of these trials depend the popularisation of the same among the general body of agriculturists. It is an unique institution, based more or less on the model of the institution of similar name in Ontario, Canada. Under the auspices of the Union is published a quarterly *Agricultural Journal*, which already takes rank as a high class and useful publication.

Mention must be made of the results accruing to Mysore Agriculture by the work carried on in the *Palace*



H. H. THE MAHARAJA'S DAIRY FARM AT RAYANKHE — CUNEDAY PHOTO

*Estates and Gardens Department*, particularly in His Highness the Maharaja's *Dairy Farm at Rayankere*, and the extensive orchards and gardens of His Highness the Maharaja in Bangalore and Mysore. The Rayankere Dairy Farm has been laid out and equipped with buildings and machinery on very efficient lines; fodder crops are raised on a large scale using large scale power machinery for the various operations and silage and hay are made on a commensurate scale. The Dairy herd consists of Scindi cows which are being crossed with Holstein Bulls. Half breeds of outstanding superiority over their Scindi mothers and vastly superior to the cows of the local breeds are being raised to stock the Farm. The evolving of a suitable commercial dairy animal for Mysore which alone can lead to a Dairy Industry of any importance in the State, is the work that is being achieved on the Farm. The Farm and its dairy herd have aroused a great deal of interest among the prominent agriculturists of the State. Likewise the gardens and orchards in which many imported varieties of apples, peaches, grapes, guavas, oranges and other fruit plants, ornamental trees and shrubs have been got out and planted on a large scale not only form centres of great agricultural interest but are influencing greatly, though silently, the fruit-growing and horticultural interests of Bangalore. Many a foreign introduction of fruit and vegetable in Bangalore can be traced to these orchards, and the term "Rajamahal" applied to some of these varieties of fruits and vegetables in the city, is a synonym for choiceness of quality.

## CHAPTER IV.

**Resumé of Work of Sections—A. Research.**

## 1. CHEMICAL SECTION.

**History.**—This is the oldest section of the Department. In fact, the Department itself has developed out of the Department of Agricultural Chemistry started in 1899 with Dr. Lehmann as Agricultural Chemist. The laboratory of the Geological Department with its two assistants was put in his charge and all chemical work concentrated under him. For work in Agricultural Chemistry proper in the laboratory, the staff was strengthened by the appointment of another Assistant Chemist. In 1904, graduates were taken up for training in Analytical Chemistry, and out of these, two were appointed Probationary Assistant Chemists. The post of Agricultural Chemist was abolished in 1908 and work was continued by the assistants till the re-organisation of the Department in 1914. From 1914-19, the staff consisted of—

One Chemist for Agricultural and Geological Departments and three Senior Assistant Chemists.

The appointment of Agricultural Chemist, created again in 1914, was not filled up till 1919 when Dr. B. Narasimha Iyengar, B.A., Ph.D., who had been sent to Germany for advanced training in Agricultural Chemistry in the University of Gottingen, returned after taking the Ph.D., degree of that University and was appointed Agricultural Chemist. Later on, the post of Chemist, Agricultural and Geological Departments, was abolished and the present staff consists of:—

One Agricultural Chemist,  
Two Senior Assistant Chemists,  
One Senior Assistant Chemist on special duty for "Spike" work,  
One Junior Assistant Chemist,  
Three Analysts and  
Two Agricultural Inspectors, temporarily attached to the Section.

The present buildings were planned by Dr. Lehmann, and fitted up completely by 1902. Since then, there have been only a few additions and alterations to the laboratory buildings proper.

**Investigations.**—The first period of work of the Section under Dr. Lehmann extends from 1899 to 1908. In addition to planning and fitting up of the laboratory, the following items of work were tackled.

1. Manurial experiments with ragi and sugar-cane in the laboratory compound.
2. Composition of juice from different varieties of sugar-cane grown in the State.
3. Losses occurring during milling of cane and boiling of juice into jaggory under methods, then in vogue.
4. Experiments on making raw sugar direct from juice.
5. The period of time which might elapse before cutting of cane in the fields and milling it before any decomposition sets in.
6. Analysis of coffee soils, methods of coffee cultivation and manurial experiments on a few estates.
7. Study of the factors which determine the quality of coffee.
8. Study of variations in the composition of fertilizers on the market, with a view to the introduction of a Fertilizer Act.
9. Nutritive value of various famine foods in the State.
10. Studies of movements of soil moisture in red soils.
11. Pot cultures on the decomposition of bone-meal.
12. Laying out the Hebbal Farm and standardisation of plots for experiments on ragi, paddy and sugar-cane.
13. Planning out seasonal, cultural, rotation and manuring experiments with ragi, paddy and sugar-cane on the Hebbal Farm.

The results obtained during the above period may briefly be summarised as follows:—

Of the varieties of sugar-cane grown in the Province, the 'pattapatti' or the striped one was found to be the best, yielding a very rich and pure juice containing over 20 per cent of sucrose in it and less than 0.5 per cent of glucose, and which keeps uniform in composition for about three months after ripening. Investigations into local practices of milling showed that, that fully  $\frac{1}{4}$  to  $\frac{1}{2}$  of the quantity of juice contained in the cane was left behind in the begasse or refuse from the mill. This led to the introduction of a new type of cattle-mill, the Nahan mill, of the Punjab for the small land-owners and a power mill from Glasgow for large sugar-cane growers like Mr. N. Krishna Iyengar of Oorgaballi. The losses taking place during boiling of juice into jaggory were also found to be considerable, chiefly due to want of adding sufficient lime to the juice to prevent inversion during boiling. With the addition of a small centrifugal to the ordinary jaggory boiling outfit and boiling the juice into massecuite instead of into jaggory, it was found quite possible to manufacture fairly



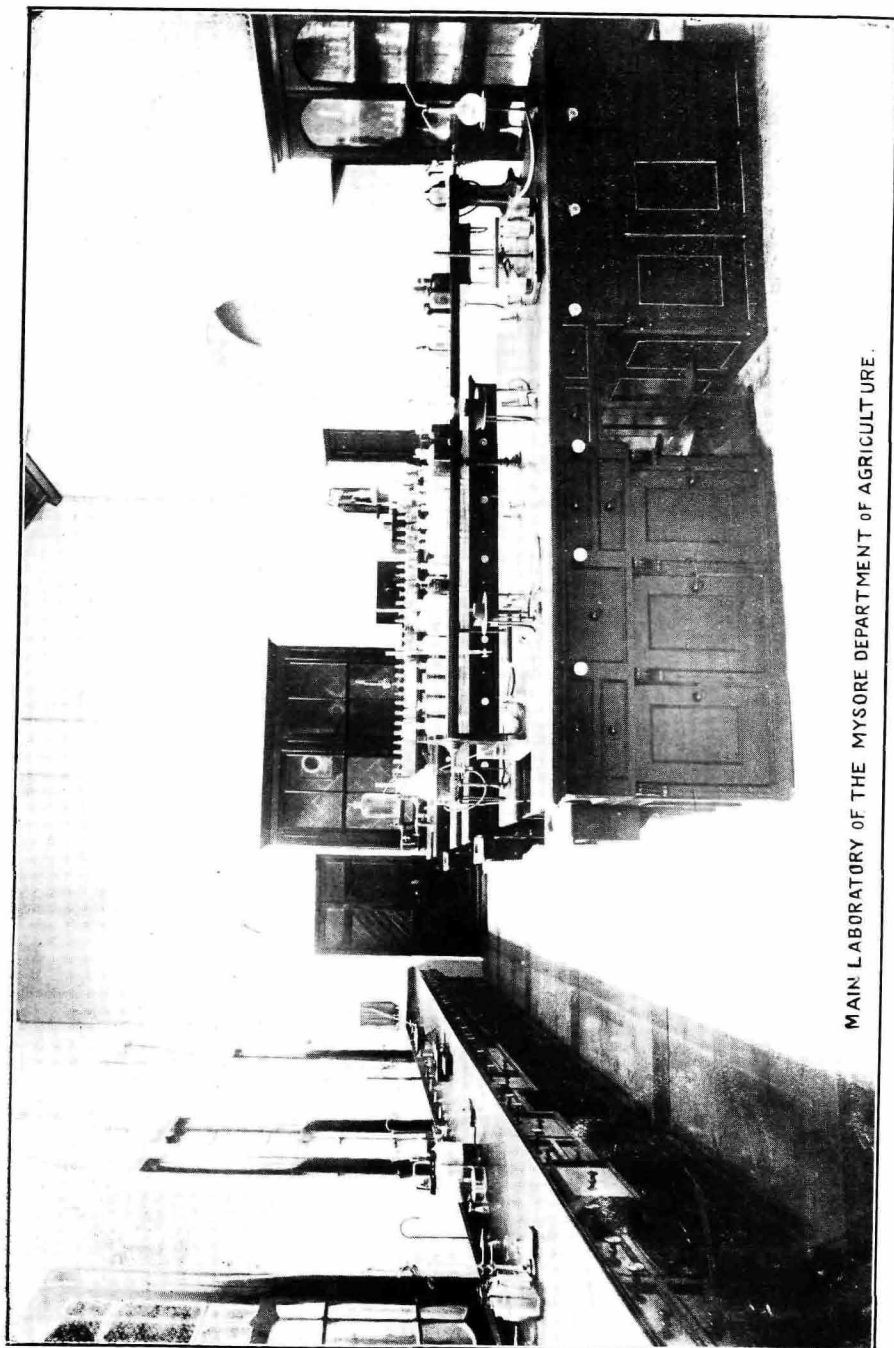
white raw sugar fit for direct consumption. It was also found best to mill the cane as soon as it was cut and boil the juice as soon as it was milled, observing scrupulous cleanliness in all operations of the mill-house and using metallic vessels instead of earthen ware pots for storing the juice.

Laboratory work on the factors which determine the quality of coffee, indicated that specific gravity of the bean was the only reliable index for the present. The manurial experiments started were not continued long enough to get any definite results. On the cultivation side, it was not found necessary to dig the soil in the estates often and a system of maintaining leaf mulch was encouraged, which has subsequently proved very beneficial to coffee estates.

The data obtained with regard to variation in composition of fertilizers on the market was put before the Board of Agriculture in India, but did not lead to the passing of any Fertilizer Act.

After the retirement of Dr. Lehmann in 1908, the items of work attended to by the Section till September, 1919, when the appointment of Agricultural Chemist was again filled up, were the following:—

1. Analytical work connected with green-manuring experiments on ragi on the Hebbal Farm.
2. Analytical work connected with seasonal planting of sugar-cane on the Hebbal Farm.
3. *Jaggory* vs. *sugar making* experiments on a large scale on the Oorgahalli Estate.
4. Influence of flowering of cane on the quality and quantity of cane juice.
5. Composition of green manures used for paddy in the Mysore District and a study of the local practices of manuring paddy.
6. Continuation of work on movements of soil water.
7. Composition of typical soils from the Mysore District and areca garden soils from Shimoga and Kadur Districts.
8. Utilisation of nitrogen added in the form of green manures to red soils under dry cultivation.
9. Composition of samples of cattle manure from various parts of Bangalore District.
10. Influence of various quantities of lime added to sugar-cane juice on the keeping quality of jaggory made from it.
11. Preparation of exhibits to the Annual Dasara Exhibition at Mysore.
12. Collection of samples of soil from all Government Farms for future work.



MAIN LABORATORY OF THE MYSORE DEPARTMENT OF AGRICULTURE.

The results obtained during this period may briefly be summarised thus :—

Of the green manures used for ragi, black gram is very rich in nitrogen, but gives a very small amount of green material. So far as bulk is concerned, sunnhemp is about the best, but it is not very rich in nitrogen.

The results of the effects of the various green manures on the yield of ragi are published in the bulletin on "Ragi Cultivation in Mysore."

The season of planting sugarcane has a great influence not only on the yield of cane, but also on the quality of juice obtained from it. The results on the Hebbal Farm show that cane may be planted from November to March or April, without in any way affecting yields and quality of juice seriously.

Experiments on *jaggery vs. sugar* making conducted on the Oorgahalli Estate showed that to compete with sugar from foreign countries, it is quite necessary to have up-to-date appliances even though we have a very rich cane like the *pattapatti*. With the addition of a centrifugal to the ordinary jaggery-boiling outfit, it is quite possible to produce good crystalline raw sugar, but the process is a very wasteful one and does not pay so long as there is not much difference in price between sugar and jaggery.

Flowering of cane is no doubt an indication of approaching ripeness. Investigation on four different varieties of cane grown under similar conditions at Oorgahalli showed that, though juice from flowered canes is of a better quality than the same from canes which have not yet flowered, yet, there need be no undue haste to cut and mill the cane soon after it has flowered. The quality goes on improving for about three months even after flowering without any loss in yield.

An investigation into local practices of green-manuring of paddy in Mysore District was made and the results were embodied in a bulletin and published.

It was found out that only a part of the nitrogen added to the soil in the form of green manures is utilised by a dry crop like ragi and that the addition of lime to help nitrification in the soil did not have the desired effect in enhancing the utilisation of green manure nitrogen.

We now come to the third period in the history of the Section. The appointment of the Agricultural

Chemist created again in 1914 was duly filled up on 1st September, 1919. The items of work being attended to since then are :—

### I. Pot Experiments :—

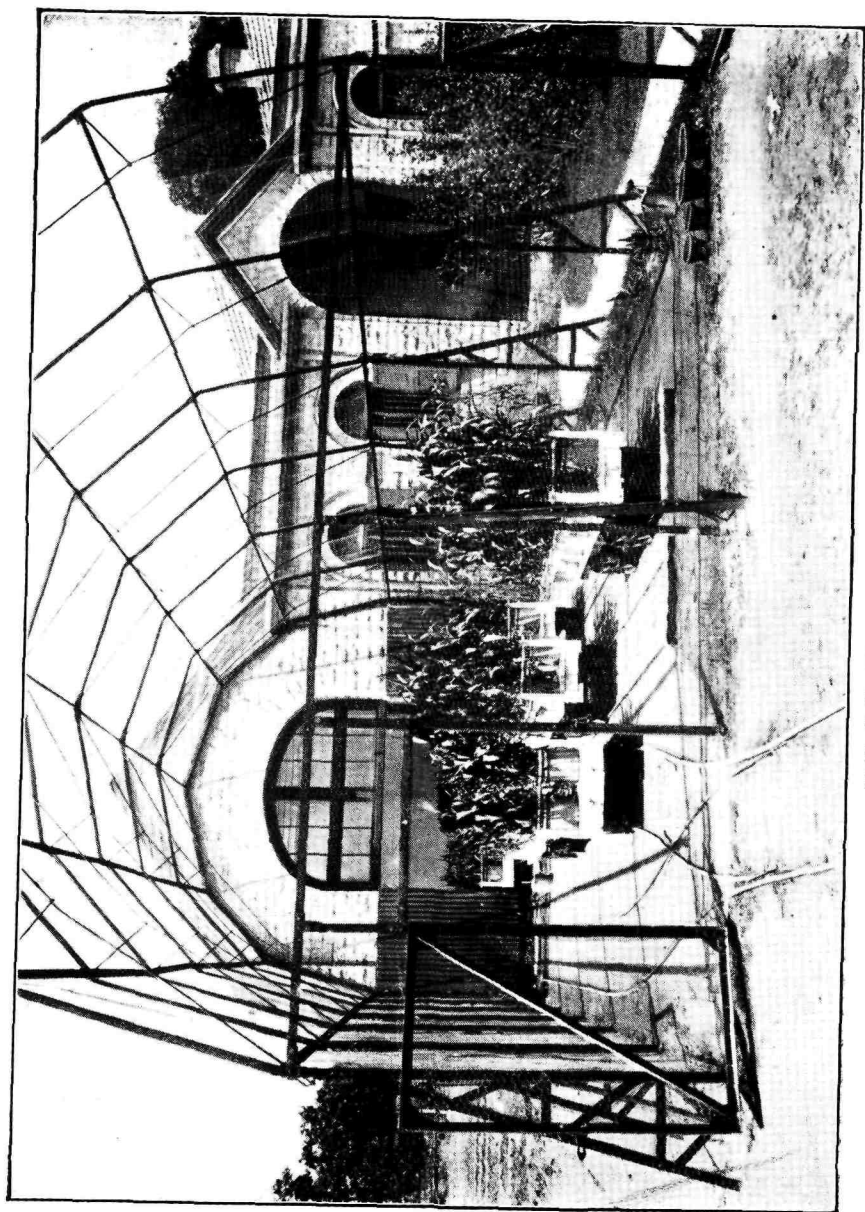
1. Water requirements of ragi, jola and sunnhemp.
2. Availability of indigenous oil cakes as compared with nitrate of soda and sulphate of ammonia.
3. Availability of phosphatic manures in red soils rich in iron and alumina.
4. Factors influencing the availability of phosphoric acid in bone-meal.
5. Manurial requirements of red soils with reference to ragi, jola and cotton.
6. Manurial requirements of black soils with reference to jola and cotton.
7. Manurial requirements of paddy and value of various paddy mixtures.
8. Influence of time of application of sulphate of ammonia on yield of ragi.
9. Availability of new nitrogenous manures like "florand" and "calcium cyanamide" as compared with that of sulphate of ammonia and oil-cakes.

### II. Field Experiments :—

1. Manurial requirements of the areca palm in the *malnad*.
2. Influence of sulphate of ammonia on the tillering and growth of sugar-cane.
3. Manurial requirements of sugar-cane under various conditions of soil and climate.
4. Manurial requirements of paddy in various paddy areas and trial of a few typical manure mixtures.
5. Trial of sulphate of ammonia and oil cakes as a source of nitrogen for ragi crop.
6. Movements of soil water in black cotton soils.
7. Manurial requirements of coffee on the Coffee Experimental Station at Balehonnur.
8. Experiments with paddy and sugar-cane on private lands.

### III. Animal Nutrition :—

1. Variations in composition of milk from cows of different breeds and during various periods of lactation.
2. Value of wheat bran and groundnut cake as concentrated feeds for young stock.
3. Influence of wheat-bran, rice bran and *dhal* husk on the quantity and quality of milk.
4. Production value and digestibility of certain concentrates along with roughage when fed to young stock of different breeds, carried out in co-operation with the Imperial Physiological Chemist.



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#### IV. Laboratory work :—

1. Analytical work connected with the above investigations.
2. Nutritive values of various indigenous fodder grasses.
3. Rate of nitrification of different oil-cakes.
4. Absorption of phosphoric acid by red, black and paddy soils and subsequent availability to plants of the phosphoric acid so absorbed.
5. Degree of acidity in various soils to find out their lime requirements.
6. Composition of typical Mysore soils.

#### V. Investigation on "spike" disease of sandal.

Since manures play a very important part in the increase of agricultural production, a large part of the work that is being done in the Section since September 1919 is in connection with the availability of various manures under local conditions of soil and climate and the manurial requirements of the principal types of soil in the State with reference to the crops grown on them. As a result of the above investigations and publication of the results obtained, the use of artificial manures like sulphate of ammonia, superphosphate and potash salts is becoming more and more popular. The Department itself has been unable to meet the demand for sulphate of ammonia, and that item of work has now been handed over to a commercial firm which has opened its own depots in places recommended by the Department. As this Section is not in charge of the popularisation of the results obtained by experiments on manures, a more detailed account of the gradual growth in the use of artificial manures will be found in the report of work in the Districts by officers in charge of that work.

The results obtained till now may briefly be summarised as follows :—

Sulphate of ammonia applied to young cane about 8 or 10 weeks after planting and in doses of about 250 lbs. to the acre has a very good influence on the tillering and growth of sugar-cane. An application of about 3 cwts. per acre of ordinary superphosphate just before planting cane in addition to the above dose of sulphate of ammonia and the usual dose of farm-yard manure has been found to act very beneficially on the yield and quality of jaggery as well.

Experiments on the manurial requirements of cane under various conditions of soil proved that, in addition to the above manures, an application of ground lime-stone at

the rate of two tons per acre increased the yield of cane appreciably on laterite soils, but not on the ordinary red soils. Experiments on the Babboor Farm have shown that it is quite possible to grow a '30 ton' crop of cane per acre using artificial manures in the area of the Vanivilas Sagar tract.

Experiments on the manurial requirements of the areca palm in the malnad have shown that in localities, where, under the ordinary system of cultivation and manuring, the yield of areca is about 20 maunds or 560 lbs. per acre of 400 yielding trees, the yield can be increased to 30 maunds by the application of a mixture consisting of groundnut oil cake, superphosphate and sulphate of potash. The most economic and profitable doses of these manures are being worked out now.

Experiments on the manurial requirements of red soils have shown that all soils respond readily to nitrogenous manures while only a few do so to phosphatic manures. A response to potash manuring seems to set in only after a couple of years of application of nitrogenous and phosphatic manures when the available supply of soil potash has become exhausted.

Work on the manurial requirements of black soils with reference to cotton and jola has indicated the usefulness of manuring the soil with nitrogen, phosphoric acid and potash. Field experiments in this direction also have just been started.

Experiments on the fixation of phosphoric acid by different soils have indicated that heavy soils like black soils and paddy soils easily fix the soluble phosphates, added as manure, while the ordinary red soil does not do so to the same extent. This has a practical bearing in determining the depth at which the phosphatic manures have to be applied in different soils so that they might not get mixed beyond the root range of ordinary crops.

Of the various paddy mixtures tried, those containing groundnut cake and superphosphate, or castor cake and bone-meal have been found as effective as that containing sulphate of ammonia and superphosphate.

Experimental work on coffee manuring has just begun and so there are no results to report upon as yet.

Work on animal nutrition carried out on the Palace Dairy Farm at Rayanakere has indicated that a mixed ration of wheat bran and groundnut cake is very useful for young growing stock and that cake has some influence



THE POT CULTURE HOUSE,—VIEW SHOWING THE BOTTOMLESS REINFORCED CONCRETE FRAMES.



in hastening maturity in heifers. Experiments on milch cows have indicated that a mixture of concentrated feed containing certain amount of rice bran in it, maintains milk yield better than the one without it.

Work on investigation of Spike, even though it has given some results of scientific value as basis for future work, has not yet yielded any results of economic importance.

Demonstration of results obtained :—

The work of demonstrating results obtained by manual experiments is in the hands of the district staff under the Deputy and Assistant Directors. When certain results have been obtained in the Pot Culture House and on Experimental Farms, those results are usually tested on private lands in selected localities before they are handed over to the district staff for demonstration work. The Members of the Agricultural and Experimental Union take a very active part in this kind of work.

Of the many trials conducted in this way on private lands, two instances deserve special mention as showing what scope there is for artificial manures in increasing food production and how an enterprising capitalistic landlord can help his tenants to grow more crops, thereby benefiting himself and his tenants as well.

One item of this work was in connection with paddy manuring in a locality under the Krishnarajasagara, where it is difficult to get either cattle manure or leaf manure. The experiment was made on 27 acres of land, all in one block, and cultivated by about a dozen tenants on "*varam*" or "share" system. The average yield per acre before the application of artificial manures was about 235 seers of paddy per acre or 6,400 seers for the whole area. In 1924-25, the very first year of the application of artificials consisting of a mixture of oil-cake and superphosphate, the yield actually trebled itself and went up to 19,400 seers or nearly 720 seers per acre with corresponding increase of straw as well. During 1925-26, the total yield was 25,186 seers or nearly 933 seers per acre. The cost of manure applied per acre was about Rs. 20.

The second item of work relates to sugar-cane experiments conducted on  $9\frac{1}{2}$  acres of land near Bangalore, cultivated on the "*varam*" system by 33 raiyats. In addition to the usual dose of farm-yard manure and oil-cake, the whole area had been manured with superphosphate

at the rate of 350 lbs. to the acre and sulphate of ammonia at 250 lbs. to the acre. The yields in former years without the use of artificial manures used to vary between 150 to 250 maunds of jaggery per acre, whereas this year with the use of artificial manures as above, the yields varied between 280 to 450 maunds per acre and the average yield from the whole area was about 370 maunds to the acre. In all, there were 1,674 boilings and 32 gallons or 320 lbs. of juice were boiled at each charge, giving an average of 2.16 maunds of jaggery per pan.

These are two rare instances in which the Department has tried the results of experiments obtained on experimental farms on a large scale on private lands at the expense of the land-lord himself. India is full of a large number of absentee land-lords. If a large majority of them would take to the kind of work described above, they would not only be benefiting themselves and their tenants but would appreciably increase the food production of the country as well.

## 2. THE ENTOMOLOGICAL SECTION.

This Section of the Department was started in the year 1908 with the appointment of Dr. Coleman as Entomologist and Mycologist and Mr. (Now Dr.) K. Kunhi Kannan, M. A., as Assistant with two fieldmen and a laboratory man. In 1911 an additional Assistant was appointed and a teaching Assistant in 1913. With the reorganization of the Department in 1914, Dr. Coleman was elevated to the position of the Director of Agriculture and the Entomological work was mainly under the direction of the senior assistant. In 1920 Mr. Kunhi Kannan was deputed to visit the important Entomological Laboratories of Egypt, Europe, the United States and Japan. In addition, he did entomological research in the Stanford University, at California, for which he was admitted to the degree of Ph. D. After return from deputation he was appointed as Entomologist. The section now consists of the Entomologist, two assistants, five fieldmen and one laboratory man.

The staff being extremely limited, the section has had to concentrate its energies on the securing of results of immediate practical value to the raiyats. The work of collection and identification of insect pests in general and the study of their life history has not been attempted.

Pests are selected for study in the order of their importance and intensive investigation is undertaken till a remedy is found. In devising a remedy, the aim is steadily kept in view that it should be simple and within the means of the poorest raiyat. The abundance and cheapness of labour in the villages is not lost sight of. Except in regard to money crops as coffee, an alternative to spraying is always sought.

The following remedies devised in the section will bear out the principles enunciated above. They are, all of them, original and for the first time recommended by this section. A brief account of the pest is added in each case.

**Hairy Caterpillars** (*Amsacta albistriga* Wlk).—A serious pest destroying the seedlings of most of the dry crops in three of the districts of the State. The caterpillars pupate in the fields themselves beyond the reach of improved ploughs and the moths emerge after each shower of the first six weeks of the monsoon. The remedy recommended is the following:—

The moths which are white and sluggish are collected by village children and destroyed. Each female moth being capable of producing a thousand caterpillars, the collection effectually prevents the out-break. (Original).

**The Rice Case Worm** (*Nymphula depunctalis*).—A serious pest of rice in the *malnad* parts of the State is amphibious. Advantage of this feature has been taken in the remedy which consists in placing a rag soaked in kerosine at the place where water enters the paddy field. The kerosine film so produced kills the caterpillars when they are disturbed on to it. (Original).

**A Rutelid Beetle on Cane and Paddy.**—This beetle being also amphibious, a fact noted for the first time in this group, the remedy described for the rice case worm has been found to answer well.

**Ground Beetles** (*Gonocephalum Hofmanssegi* stev).—The larvae of these are root feeders of several cereals and potato and cause serious damage in certain years. Fresh roots of grasses pulled out are placed about the field and the adults attracted are gathered and killed. This attraction to roots has been recently confirmed by investigators in Russia of an allied species. (Original).

**Pulse Beetles.**—These attack stored pulses and cause serious damage. It was found for the first time that adults come to the top surface of the bin for purposes of copulation and egg laying. A layer of sand one inch thick

on top of the seeds will allow the beetles to pass to the surface but they fail to get back to the seeds and so die without laying eggs. The pulses are thus saved. The withdrawal of the pulses is through a hole in the bin at the bottom. This remedy dispenses with fumigation with poisonous or inflammable chemicals. (Original).

**Sugar-cane Borer** (*Diatroea spp.*).—The caterpillars boring into young shoots are reached with difficulty. The moths have, however, been successfully attracted to small heaps of cane trash placed in the cane field which at the time of visit of the moths are usually bare of vegetation and afford few hiding places during the day. The moths are easily collected by children and destroyed. The collection has to continue for about two months and will not cost more than Rs. 2 per acre. (Original). (Account published in the International Sugar Journal. January 1923).

**Lime Tree Borer** (*Chelidonium cinctum*).—Adult beetles emerging in May, lay eggs in the fork of small twigs. The larva emerging, girdles the twig to cut off the sap and then goes into the twig where it remains for a month or more before descending to the main tree. The girdled twig which dries is conspicuous and breaks off easily. The remedy consists in breaking off the twigs in time by means of a forked stick. The twig is caught in the fork of the stick and the stick is given a sharp turn when the twig breaks off. (Original).

The Orange Borer in Coorg considered for many years as a different species has been found by this Department to be identical with the lime tree borer and therefore susceptible to the same treatment.

**The Rice Grasshopper** (*Heiroglyphus banian Fab.*).—

A pest on paddy and sugar-cane in certain parts of the *malnad*. The eggs are laid on the bunds in which the young remain for a few weeks. The insects are then caught in bags swept over the bunds. Cost about Rs. 4 per acre.

**The Jola Grasshopper** (*Colemania sphenaroides Bol.*).—

A serious pest on jola and allied crops in certain parts of Shimoga and Chitaldrug Districts. The eggs are laid in the fields and the young feed on the young crop. Grasshoppers are caught in bags swept over the crop. Cost about Rs. 4 per acre.

**Green Bug on Coffee** (*Coccus Colemani Kann.*).—A serious pest of coffee in years of drought. Controlled

by spraying fish oil resin soap when bugs begin to multiply.

**The Avare Pod Borer** (*Adisura atkinsoni*).—The caterpillar bores into pods of *dolichos lab lab* and causes damage estimated at several lakhs of rupees annually. The few moths which appear about the time the young pods appear on the crops, lay eggs on them and so start the first generation. Village children rub off these eggs from the pods and kill the caterpillars twice at an interval of a week. Damage is thus very much reduced. (Original-Remedy not yet tested on a large scale).

**The Jola Ear Head fly** (*Contrarina andropoginis* Flt).—These minute flies lay eggs in the developing grains of jola and so destroy them. A broad piece of cloth about 2 or 3 square yards covered with a mucilaginous substance is carried as a canopy over the crop and the crop is shaken. The flies which usually oviposit in the mornings are then disturbed but on flying upwards are caught in the mucillage and killed. (Original-Remedy not yet tested on a large scale.)

**Coffee Borer** (*Xylotrechus quadripes* cher).—A serious pest of coffee tunnelling the stems and causing damage extending to several lakhs of rupees in the State. Adults emerge during October to December and are easily caught by the hand. Children of estate coolies, sent round in the afternoons, are able to catch most of them. Damage is reduced considerably and the cost does not exceed Rs. 10 per acre. Remedy has stood the tests on three estates for three years. Not yet recommended for general adoption.

In addition to these, the following pests are being investigated :—

**Mango Hoppers** (*Idioceros* spp).—Life history work completed 12 years ago. Investigation continued in order to find a simpler remedy than spraying.

**The Rhinoceros Beetle** (*Oryctes rhinoceros*).—Method of feeding ascertained for the first time. A remedy based on this information being attempted.

**Epilachna on Potato** (*Epilachna* 28 *punctata*).—Search for alternate hosts plant and for habits during intervals between crops being made to find a simpler method than spraying and dusting.

**Cockchafer Grubs**.—Attacking sugar-cane and other crops. The life history work has been completed.

Spraying is recommended in regard to crops other than money crops only in cases of urgency and of limited

areas. The *fish oil resin soap* now sold extensively by the Madras Fisheries Department all over India and Ceylon was prepared first at the instance of this Section and according to the formula given by it. It was first tested and recommended for general use by this Section.

The following *scientific results* have been obtained:—

(1) The insecticidal property of mercury. Small quantities of mercury as  $\frac{1}{2}$  gram weight have been found to exert such an effect on the eggs of pulse beetles and certain other insects that their contents disintegrate and disappear. Results confirmed by investigations in the United States. *Vide* Journal of Economic Entomology, Vol. 1923.

(2) The principal has been established that legless insects require purchase for penetration into hard material. (Subject for thesis for the Ph. D. Degree of the Entomologist). Bull. No. 6, Dept. of Agriculture.

(3) The principle has been established that where in an insect the larva is soft bodied and the body of the adult hard, the interposition of a screen of suitable mesh would prevent the return journey of the adult from pupal chamber. (Bull. Entomological Research).

In addition, the following subjects of scientific interest are being investigated when time can be spared from other work of a more urgent character.

(1) The suctorial apparatus of Cicada.

(2) *Strepsiptera*. (A group of interesting parasites on certain insects).

(3) A hypothesis in regard to protective resemblance.

**Extension Work.**—A great part of the energies of this Section is taken up in the demonstration of the remedies and in extensive campaigns. A list of the bulletins and circulars issued by this section is given in the Appendix. In addition articles are prepared for the calendar, the Union Journal and the Vernacular Press. The first poster on an insect pest to issue in India was from this section. Where the remedies are exceedingly simple and require very little work and attention on the part of the raiyat, they are demonstrated on the spot to carry conviction. Where continuous work extending over several villages is necessary and without co-operation satisfactory results cannot be obtained, the campaign is organised by the section and carried out under the supervision of a responsible officer stationed in the area. A Pest Act has been considered necessary to secure the co-operation of the raiyats. Regulations under the Act are drawn with reference to the pest to be controlled. These are published in the State Gazette and copies in Kanarese are distributed among the villagers well in advance of the time when

work is to be started. A brief account of the campaign against dairy caterpillars which has been carried on year after year for several years will illustrate the further procedure followed. A coloured chart illustrating the life history and the method of control of the pest was printed and copies of it distributed to all villages and village schools. A circular in Kanarese has also been similarly distributed, followed by copies of rules drawn up under the Pest Act. An officer tours in advance of the season in the villages to get the raiyats to contribute towards expenses of the collection of moths and the selection of fieldmen. A man is appointed for each village on a remuneration of Rs. 10 for the whole season. A block of several villages is in charge of a man on Rs. 15 a month. The staff is supervised by the officer who is stationed in the area. With the permission of the Inspector General of Education, the schools in the locality are only held in the mornings, the children being thus free for picking work in the after-noon. The children are paid for the moths brought in at a rate varying from quarter anna to one anna per hundred. The fieldmen are paid by Government.

So far, no prosecutions under the Act has been found necessary. The results of the work are so well appreciated that villages not taken up have applied for inclusion in the declared area. While the work is popular the time has not yet come when it may be left to the raiyats themselves, for they are unanimously of the view that unless there is an officer to tour round to organise, stimulate and guide, the campaign will not receive from them the continuous attention it needs for good results. The campaigns against other pests like jola grass-hopper, the rice grass-hopper and the green bug of coffee have been conducted more or less on similar lines.

**Financial Aspect.**—During the first few years of the section the cost was no more than Rs. 10,000. In the course of 18 years of its existence the expenditure has increased to Rs. 20,000. The return to the raiyat for whose benefit the section exists is not easily estimated with any fair degree of accuracy for there are too many variable factors. It is determined with greater accuracy in regard to hairy caterpillars against which the campaign has been carried on for nearly a decade. The saving of crop from damage as a result of last season's work alone against it, is rupees two and a half lakhs. The remedy

against the orange borer in Coorg is estimated to effect a saving annually of at least 6 lakhs.

**Future Programme.**—Work will continue on the same lines as in the past. The names of pests whose investigation is incomplete have been given. How many may be added to the lists of pests to be studied will depend on the strength of the staff which is far short of the requirements of a State so pest-ridden as Mysore and on the facilities for rapid investigation which do not exist at present. The campaign against pests which takes so considerable a time of the staff will be left in the hands of the raiyats themselves at the first opportunity. Every effort will be made to speed up the day by utilising Village Panchayets to be created under the Panchayet Act. Money has been sanctioned for developing Bee-keeping as a cottage industry and work will be taken on hand before the end of the year. The introduction of suitable plants yielding honey in areas where such are not found to exist or exist in insufficient numbers will be part of apicultural work. One such plant has already been introduced from America and has flowered for the first time. The testing of indigenous plants used as fish poison for insecticidal properties already begun will be continued. One plant has already been imported from abroad and is now being grown on the grounds of the laboratory. The popularisation of a small hand sprayer, simple in construction, which the poor farmer may use against pests in their initial stages is also contemplated.

### 3. THE MYCOLOGICAL SECTION.

The Mycological work of the Department commenced with the appointment of Dr. Coleman as Mycologist and Entomologist in the year 1908, with Mr. (now Dr.) M. K. Venkata Rao, M.A., Assistant Mycologist. In 1913 when Dr. Coleman was appointed Director, the post of Mycologist was abolished, the work being continued to be done by the Assistant Mycologist. Two more Assistants were appointed, one in the year 1913 and another in 1915. Dr. Venkata Rao who was then deputed to Europe and America for advanced training returned after having taken the Cambridge University Diploma in Agriculture, and the Degrees of M.Sc. and Ph.D. in the University of California and was appointed Mycologist in 1923. The Staff at present consists of the Mycologist and two Assistant Mycologists and a small field staff.





SUGAR-CANE BORER REMEDY,—CATCHING MOTHS HIDING  
IN THE TRASH TRAP.

The work of the Section is described below :—

### Investigation.

#### ORIGINAL WORK DONE HERE AND REMEDIES SUGGESTED.

The work of outstanding merit has been :—

(1) the discovery of the organism causing the *keleroga* of areca and,

(2) the finding out of the life history of the fungus causing black rot of coffee including the finding of additional hosts. Remedial measures advocated against both these diseases have met with great success.

#### 2. ADAPTATION OF WORK DONE ELSEWHERE.

Work in this direction consisted of :—

(1) studying the life history of the smut on *jowar* and comparing it with work done elsewhere and testing remedial measures used elsewhere,

(2) studying the bacteria causing the ring disease in potato and confirming work done in the United States of America, and

(3) study of all the more important diseases of sugar-cane for writing up a monograph on sugarcane.

#### 3. WORK IN PURE SCIENCE.

(1) The study of the *azotobacter* and nitrate and nitrite bacteria in the Mysore soils was completed,

(2) the discovery of bacteria in casuarina nodules,

(3) gradual collection of herbarium material of the phanerogamic and the fungus flora of Mysore,

(4) finding out of additional species of *phytophthora* and doing cross inoculations on same,

(5) independent discovery of the sclerotial stage of *sclerotinia vicini*,

(6) a disease due to *rhizoctonia* on gingely, potato, etc., was independently discovered here,

(7) successful budding of plants belonging to different orders, as sandal, zizyphus, etc.,

(8) disease due to *thielaviopsis* on plantain was worked out in some detail,

(9) study of the smut on ragi and *cercospora* leaf spot on same crops,

- (10) discovery of yeast organisms in insects,
- (11) study of phalloids,
- (12) study of ecological factors on *malnad* flora was made and a paper read at the Indian Science Congress, and
- (13) work of cultivating and studying entomogenous fungi.

#### WORK IN VARIOUS STAGES OF COMPLETION.

(1) Work on the *anaberoga* of areca and cocoanut due to *ganoderma lucidus* is being continued and remedial measures are being tried.

(2) Work on the stump rot of coffee was partially completed and remedial measures were also carried on.

(3) Study of the spike-disease on *sandal* including micro-chemistry of the tissues involved was done and the communicability of the disease through grafting and haustorial root connections was definitely proved. A bulletin was issued, a conference was held and articles were contributed to the Indian Forester.

(4) Investigations of leaf rust and die back on coffee have been started.

#### Extension.

#### TRIAL OF EXPERIMENTAL METHODS AT GOVERNMENT COST.

(a) Investigation of the use of Bordeaux mixture and powders on the diseases of crops was started. Spraying with B. M. is being now done in co-operation with ariculturists of the State. The use of

- (1) different adhesives and
- (2) of different strengths
- (3) of different composition and

(4) in different physical forms in areas of different rainfall is being continued in the Experimental Farm at Marthur and on lands of members belonging to the Agricultural and Experimental Union.

(b) Use of soil disinfectants against root diseases of coffee and arecanut has been tried at various times but investigations are not complete.

(c) Successful control of abortion in broodmares which was due to ergot infected fodder.

(d) Control of stein bleeding disease of cocoanuts by excision of affected parts and painting with hot tar has also been investigated.



LIME TREE BORER REMEDY,—BREAKING OFF TWIGS  
CONTAINING THE BORER.

(e) Rotation of crops to prevent the ring disease of potatoes has been studied and demonstrated on the Farms.

#### DEMONSTRATION OF KNOWN METHODS ON LARGE AREAS.

(1) Packets of weighed quantities of copper sulphate are prepared and sent over to the agricultural depots in the smut infected areas for sale to cultivators of *jowar* crops together with instructions in Vernacular for use.

(2) Progressively increasing sales of sprayers and materials for spraying with Bordeaux mixtures in diseases of areca and coffee have been kept up. The total material thus sold since the inception of this Section is estimated at 100 tons of copper sulphate and other materials as lime, resin, soda *prorata* and 2,300 pressure sprayers of 1 gallon capacity manufactured by Gebr. Holder & Co. of Metzingen, Germany, which was first introduced into India by this Department. Last season, 6,600 acres of arecanut alone were brought under our methods of control and this area is scattered over a length of 90 miles and a width of 60 miles in one of the most inaccessible areas of the State.

(3) Progressively increasing use of casein as an adhesive in the preparation of Bordeaux mixtures. The total casein thus sold within the last three years is 6 tons or material enough to treat 13,000 acres.

#### Organisation.

This Section in consonance with the traditions of the Department directly supervises the field work through the fieldmen permanently employed and local men temporarily engaged during seasons of stress. The season for spraying being short, large numbers are employed for a short season only. The men are trained for the work and will be useful in their locality even when they are not in the service of the Department. In addition to organising co-operative spraying on large areas, partly by the introduction of the Pest Act, it has co-operated with the Madras and Bombay Agricultural Departments in introducing spraying in the areca gardens of North and South Canara and has been instrumental in supplying materials to both these administrations as well as a few Co-operative Societies. It has also to its credit the importing of material early in the season direct from manufacturers and stocking them in the stores in out-of-the-way villages

where the cultivators can purchase sprayers, spraying materials and spare parts or have their sprayers tested and rectified. As the work develops in definite areas, more and more work is being turned over to private individuals and Co-operative Societies.

### Future Programme.

(1) In addition to completing works mentioned above which are partially investigated, work will be taken up on other diseases to which attention could not be given hitherto, for example, (a) the *hidimimdige roga* of areca which is suspected to be due to bacteria (b) premature dropping of areca nuts due to bacteria (c) *anduodaka* or basal-cracking of areca nuts (a physiological disease?). The black bean disease of coffee, diseases of plantation and garden crops like pepper, cardamoms and apples which have hitherto received practically no attention will also be taken up.

(2) Completion of the material for the *flora* of Mysore, and the local fungal *flora* will be attempted.

(3) More and more use will be made of the Co-operative Societies as agents for selling spraying materials and sprayers and giving such local help as they can.

(4) Advanced instruction in Mycology will be given to passed candidates of the Agricultural School who show a special aptitude for mycological research.

(5) Plant breeding work for disease resistance with special reference to coffee will be taken up.

(6) Investigations of *phaneorgamic* parasites notably *striga* on cereals and sugar-cane will be taken up.

(7) Such other work as may be decided upon at the Annual Departmental Conference will also be taken up as far as facilities permit.

### 4. THE BOTANICAL SECTION.

The work of the Botanical Section comprises mostly of breeding work on the main crops of the State. The breeding work on ragi, sugar-cane, groundnut and potatoes has been conducted on the Hebbal Farm. The breeding work on cotton and jola are carried on in the Babboor Farm. The laboratory work is conducted in the Central Laboratory of the Department.

A certain amount of testing of varieties, introduction of new crops and their trial was being done ever since the inception of the Department mostly on the Hebbal Farm



SPRAYING ARECANUTS AGAINST 'KOLEROGA.'

in addition to the experiments on crop husbandry in general. The outcome of these as far as the introduction of crops or varieties into general cultivation is concerned was the introduction of short season groundnuts and the Java and the Red-Mauritius sugar-cane. The work of systematic Plant Breeding by selection and other methods was commenced only from the year 1914, when Mr. Badami Venkata Rau, L. Ag. was appointed Assistant for Botany. Mr. Venkata Rao was later deputed to Cambridge to study plant breeding under Sir R. H. Biffen for two years, during which period he also visited the important Plant Breeding and Seed Improvement Stations in Sweden and Denmark.

The staff now comprises of the Senior Assistant Botanist, one Junior Assistant Botanist and three Agricultural Inspectors. The work of the section is described below :—

#### 1. PLANT BREEDING.

1. *Hain ragi* varietal tests at Hebbal.
2. *Kar ragi* varietal tests at Mysore and Deboor.
3. Plant selections in *hain ragi*.
4. Collection of varieties from different ragi areas within the State and from other parts of India.
5. Sugar-cane varietal tests.
6. Introduction of Indian and exotic canes.
7. Raising seedlings and selection work.
8. Groundnut varietal tests, spacing experiments and hybridization.
9. Cotton, collection of varieties, individual plant selections and hybridization. Classification of Mysore cottons.
10. Preliminary work on Mysore castors and *avares*.
11. Seedling work in potatoes.
12. Methods of varietal tests, preliminary trials in the Districts and distribution of pedigree seeds ; conducting trials in the Districts on the fields of the members of the Agricultural and Experimental Union and collecting data from them prior to the general distribution of any seed in any locality.

The results obtained so far may be summarised as follows :—

**Ragi.**—(1) Of all the types of *ragis* introduced, the local type was found to be the highest yielder in this locality. Those having heavy heads seemed to suit moist conditions or rainy seasons. The small headed ones were found to tiller freely.

(2) In irrigated *ragis*, the continued selection of ear heads for seed purposes was found to result in heavy yields



but it required selection in every season to keep up the strains.

(3) Most of the varieties were found mixed with others. Purified types gave higher yields and came to an uniform maturity resulting in the production of high grade seeds.

(4) Individual selections were made in large numbers. In later years selections were made in the fields alone in different parts of the State. Many selections were found to be superior to the varieties from which they were selected.

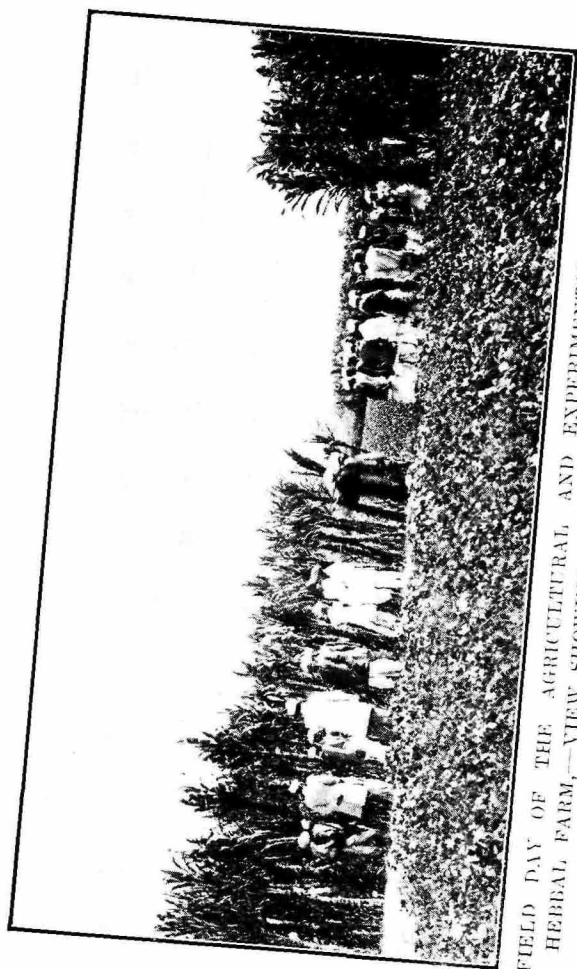
A large number of selections has been tested over five to eight years and many of them have been found to be superior to the local variety. Such ones have been multiplied, tested in various localities and distributed. The most popular ones are H. 22, H. 2, H. 13, H. 40, and H. 44. The Hebbal (No. 22) has been distributed very widely and it has now spread over a hundred thousand acres in the State. In many places, yields ranging from 20 per cent to 30 per cent more than the local yields have been obtained. Its drought resistance, heavy yield of good grain and a large amount of straw, have made it a popular variety in the State.

(5) In *Kar ragi*, it was found that drilling in rows gave higher yields of grain for all varieties; broad-casting gave more straw. The violet open type was found to be the most prolific one. Some distribution of this seed has been made.

(6) Some garden *ragis* having very big heads have been evolved by selection. Four of such ones are being multiplied for distribution.

**Sugar-cane:**—(1) In the varietal tests, it was found that Red Mauritius was the most vigorous and gave the highest yield of jaggery. But its juice was poor, containing less of cane-sugar and more of glucose. The jaggery was of an inferior kind having a reddish tinge and liable to run in the monsoons. B. 208 was a rich cane in sugar, but its yields were quite disappointing. Java Mysore or Java cane acclimatized in Mysore is spreading in the western part of the State and J. 33 A., another Java cane in the dry parts of the State.

(2) In spacing experiments it was found that the wider spacing up to 3 and 4 feet gave higher yields and reduced the amount of seed rates at the same time. Wrapping of canes was found to promote healthy growth and protect the canes against the ravages of jackals and



FIELD DAY OF THE AGRICULTURAL AND EXPERIMENTAL UNION ON THE  
HEBBAL FARM,—VIEW SHOWING MEMBERS INSPECTING THE SUGAR-CANE  
VARIETAL TESTS.

sun scalding. Further, it enables one to give a clean cultivation. In regard to spacing, it was found to depend upon the fertility of the soil, manuring and the capacity of the variety to tiller and form healthy uniform canes.

(3) Cane seedling work was started in Coimbatore in 1911 and 1912 and plenty of material was collected in Mysore for that work in 1913. When it was found that the Mysore Plateau was congenial for the cane to flower and set seed, evolving cane seedlings was started in 1913. While Coimbatore confined its activities to the evolution of canes for Northern India and hybridization work for combining desirable characters, Mysore confined itself to the evolution of thick tropical canes to suit the local conditions. All the exotic and indigenous canes of India were collected and the standard collection has been maintained all along. They consist of all the best known canes in the cane growing countries. Many of them were found to flower freely and set seed between September and January. All of them were found to be hybrids and a good deal of segregations took place in the batches of seedlings. Advantage of this hybrid nature was taken in raising vast numbers of seedlings for selections. After methods were perfected for raising seedlings, the nature of seedlings from various parentage was studied. Some parents like B. 208 produced rich canes without much vigor, whereas vigorous canes like Red Mauritius canes produced vigorous seedlings with rich canes and many desirable colours and other agricultural qualities. As a result of rigorous selection on morphological characters and chemical analysis of thousands of seedlings every year, many selections were made and tested for production. Seedlings like H.M. 544, H.M. 320, H.M. 312, H.M. 553, and H.M. 315 have been very promising. Some of them have been tested in typical areas of the State for production and quality. H.M. 544 has given even over 50 tons of canes per acre in several fertile tracts and H.M. 320 is now competing with it both for yield and quality. This seedling work has a great future before it and several hundred acres are already under these Mysore seedlings within 6 years after their evolution.

In 1922, there was a general flowering of potatoes in Mysore and several varieties formed fruits. On examination it was found that the exotics formed seedless fruits owing to partial fertilization. Fertile seeds were found in the local variety. For the first time at least in South

India, seedlings were raised in large numbers from the seeds obtained in the season. To raise disease-free seedlings a dry area was selected, a new well was sunk and the land brought under irrigation to plant the batch of 9,000 seedlings. About 4,000 of these formed small tubers. Early in 1923, they were all planted and found to grow into normal state, producing various kinds of tubers of all shapes, sizes and colours. Many of them had great vigor and promised to raise the maximum yield of 350 maunds in the State at least to twice the quantity. There are now over 200 selections under observation and the work is quite hopeful. It seems quite possible to raise potatoes under Bangalore conditions to suit not only the Hill Stations, but also the hot but fertile plains of South India.

**Cotton.**—(1) The Mysore cottons were studied and classified in 1917. Those grown in the southern parts of the State were found to be *G. obtusifolium* (Nadam) and those grown in the cotton tracts in the northern districts to be *G. hirtaceum* (Sannahatti). Sannahatti was found to be a mixture of many types and very many strains were isolated for study. Some of them like the naked seeded ones were found to be highly heterozygous in nature. Some strains like those of Hiriya were found to be more productive than the Davanagere cottons.

(2) In 1915, a large number of plant selections was made in the local sannahatti. They were studied for quality and ginning percentage in the laboratory. The best ones were grown in pure line cultures. Out of this work has been evolved two of the Mysore's best selections, Nos. 69 and 45 which have very good ginning and spinning qualities. As to yield and vigor, they are equal if not superior to the local cottons. The area under these selections is about 15,000 acres.

(3) A collection of exotic *hirsutum* and Indian cottons was made and tested at Babboor. The local Dharwar-American (*Doddahatti*) was susceptible to the red-leaf-blight disease. As the black cotton tracts in Mysore are restricted to a small area in the State, it was found necessary to evolve varieties out of *doddahatti* or strains similar to it, to suit the red soils of Mysore if the area under cotton had to be increased. A large number of plant selections was made and some of them are promising.

(4) **Hybridization Work.**—A large number of crosses made between the local cottons and the exotics were

failures. Some of them set seed but they were ill developed or had no vitality to develop.

Some successful crosses between *G. hirsutum*s and *G. arboreum*s have been successfully made and the segregates are being studied now.

Crosses between tree cottons and *doddahatti* have been very successful. The segregates have been studied and selected up to the fifth generation now and some of them have been very promising. In the habit of their growth, size of bolls, ginning per cent, quality of lint and immunity to red-leaf-blight, they are highly satisfactory and quite promising,—especially, M.A. II, M.A. III and M.A. IV. Some of them have been already distributed to the cultivators.

Successful crosses have been also obtained between the Tree cotton x Trice, Tree cotton x Lone Star, Tree cotton x Cambodia, Tree cotton x Uganda. They are all under observation.

**Groundnut.**—Twelve varieties which are common on the market in India were under observation for several years. The spreading varieties were found to yield more than the bunch varieties but the latter were found to contain more oil. Closer planting in all cases gave more yield per acre. The optimum distance was found to be about 6 inches. The early bunch varieties are spreading in the northern districts where it is impossible to grow long duration ones. Groundnut after ragi in rotation was found to greatly increase the succeeding crop of ragi. Hence the spread of groundnut cultivation would not reduce the staple food grain supply in the State, but would on the other hand improve the fertility of the soil and provide the cultivator with ready cash to keep him free from indebtedness.

With a view to combine the desirable qualities in the bunch varieties and spreading varieties, crosses between the various types were made and the results have been highly successful.

(1) A natural cross between Spanish and Big Japan has resulted in the evolution of *H.G. No. 1*, one of hybrid origin. It is erect, vigorous, big podded, contains many seeds and ripens earlier than the spreading varieties. It resists drought very well and is highly resistant to leaf disease. The pods have all the commercial qualities required by the trade. It is now being multiplied for being distributed.

(2) Crosses between small Japan and Virginia have given many interesting segregates. Many new combinations have been formed and over 200 selections are now under observation. Some of them are very promising.

(3) Further work on the hybridization of groundnuts has been carried on. Over 25 combinations are now under observation. It is hoped to evolve superior kinds of groundnuts out of this work and the indications are quite encouraging.

**Castors and *avares*.**—A large collection of varieties is under observation and several types of castors have been distributed for preliminary trials.

**Grasses.**—Indigenous grasses have been isolated and grown in pure lines. They are being studied for their habit, yield and nutrient qualities.

A few exotic grasses also were secured from America. Out of these the Natal grass is promising and it has begun to run wild on the Farm.

A detailed study of the Legume *Sesbania-Aegyptica* was made. It was found to grow well under dry land conditions and could be cut several times a year. It is very nutritious and a very desirable fodder plant.

## 2. LABORATORY WORK.

**Ragi.**—(1) Fertilization of ragi flower was made in 1913. It was found to be a self fertilized flower under Mysore conditions in most cases. The pollen grains were found germinated on the stigma long before the glumes opened. Discovery of this fact helped us greatly to start pure line selections in ragi.

(2) Methods of germinating pollen grains in moist chamber cells were discovered. This helped us to test the vitality of pollens of different varieties.

(3) Methods to induce the anther-sacs to emerge out of the glumes without bursting inside were found. By this it is possible to prevent self-fertilization and conduct hybridization. This method is hoped to be useful in breeding other small grained cereals.

(4) The root system of the crop also was studied.

**Sugar-cane.**—(1) Flowers of various varieties were studied to find out the fertile ones.

(2) Seeds were preserved for over six months and tested for germination.

(3) Methods of raising seedlings were evolved.

(4) Pollen grains were successfully germinated in moist chambers.

(5) Study of seedlings, their habit and the quality of juices were examined.

**Cottons.**—(1) Various methods were tested for germinating cotton pollen. None was successful.

(2) A method of germinating cotton pollen on castor oil drops in moist chambers was discovered. This would greatly help in testing the vitality of pollen grains in hybridization work. A partial drying of pollen grains seemed to increase the percentage and rapidity of pollen germination.

(3) Successful graftings were made, both by approach grafting and tongue grafting, to find out the effect of the root system of one variety over the other.

(4) Cytological study of the tree cottons and Mysore cottons is in progress.

**Groundnuts.**—(1) The groundnut plant was studied in detail.

(2) Methods of hybridization were evolved.

(3) Breeding work was continued on a large scale.

(4) A detailed cytological study has been made. It was found that the spreading types in general had 20 chromosomes and that the bunch types had 10 chromosomes. On this basis, the types have been classified into two different species, and in this species of crosses, probably owing to the disparity in the number of chromosomes, various combinations have taken place, giving rise to numerous segregates.

Cytological work on the behaviour of hybrids and other phases of chromosome behaviour in crosses are in progress.

### 3. DISTRICT WORK.

(1) Test plots were laid in the districts and varieties of ragi and sugar-cane were tested over several years before the selected strains were handed over for general distribution.

(2) Selection of plants has been made in the fields in several localities.

(3) Varieties of paddy in the Malnad Farm were purified by rouging.

(4) Selected strains from the breeding plots were tested on the various Government farms.

#### 4. INSTRUCTION.

(1) School work at Hebbal.—The senior students were trained in the elements of Economic Botany, Gardening and Plant Breeding.

(2) Demonstration work in the Districts and Taluk Conferences.

(3) Preparation of Exhibits for the "Industrial and Dasara Exhibition" and District and Taluk Exhibitions.

(4) Issuing of circulars in English and Kannada as to methods of selection and carrying out plot trials.

(5) Publication of popular articles in the calendars and the Union Journals.

#### Future Programme.

(1) Evolution of new varieties of ragi, groundnut, and sugar-cane by hybridization.

(2) Improvement of paddy in the *malnad* and canal tracts.

(3) Improvement of potato cultivation by the production of disease-free seedling potatoes.

(4) Cytological investigations on important tropical crops.

(5) Training of post-graduate students and research workers in Genetics and Plant Breeding in general.

#### 5. AGRICULTURAL ENGINEERING SECTION.

This section was constituted in the year 1915, with the appointment of an Agricultural Engineer. After two years a small staff of subordinates was provided. The work of the Agricultural Engineering Section mainly relates to the teaching of Engineering in the Hebbal Agricultural School. In addition, this section looks after all the Civil and Mechanical Engineering work of the whole department. The planning and the construction of the buildings on the Farms including the lay-out, roads and drains, is carried out by the Agricultural Engineer.

The installation of and attention to the pumping machines, sugar-cane crushing machines and ginning machines on the various farms has formed part of the work of this section. Such large scale implements as the department possesses such as tractors and tractor-ploughs, etc., are also in charge of this section.



In the midst of these duties, this section has paid attention to several important projects connected directly with agricultural improvement. They are :—

(1) The design and the execution of the “ Mysore ” plough after numerous trials and alterations. The work was all carried out in the small workshop on the Farm, until the model was ready to be sent to Messrs. Ransome Jeffris and Company in England for production in bulk.

(2) A very large amount of work has been carried on and is still in progress in the devising of a small seed drill for Mysore, as the existing indigenous drills, though simple and ingenious, have still some important drawbacks. Several models have been made and tested ; it is expected that one will be decided on very soon as fit for manufacture in numbers as in the case of the Mysore plough.

(3) A small and suitable begasse burning furnace is now being generally recommended, as the result of much work done in collaboration with the Hebbal Farm staff in the designing of more than one type of fuel saving furnace for jaggery boiling.

(4) Accurate experiments on the “ duty of water ” in paddy cultivation on a somewhat elaborate scale relating to several methods of using and economising irrigation water have been conducted and are being continued.

The Agricultural Engineer not only attends to requests from raiyats for technical advice regarding the installation of pump and engines, farm drainage and irrigation, and survey of lands but also arranges to carry out or supervise work that may be started as the result of the advice. The future programme consists, in addition to the work of the above kind, to the testing of imported implements of various kinds and investigating the possibilities of adapting them for local conditions.

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## CHAPTER V.

**Research** (*continued*).

## THE GOVERNMENT EXPERIMENTAL FARMS.

The Government Experimental Farms are five in number, *viz.*, (a) The Hebbal Farm, (b) The Marthur Farm, (c) The Babbur Farm, (d) The Nagenahalli Sugar-cane Farm and (e) The Balehonnur Coffee Farm.

*The Hebbal Farm.*

This is the oldest of the five Farms and was opened in the year 1904. It is situated in the village of that name, about five miles from Bangalore. The tract is representative in a general way of the red soil areas which largely comprise the Bangalore, Tumkur & Kolar Districts.

It comprises an area of 20 acres of wet land and 60 acres of dry land. The wet land is commanded by a good irrigation tank and is further protected by an irrigation well.

On the farm is also situated the Agricultural School, with its adjuncts, the Veterinary Hospital and the Hebbal Dairy.

A small workshop which comprises the Agricultural Engineering Section and which also gives instruction in carpentry, smithy work, and fitter's work to the students is also located on the farm.

A herd of crossbred (Merino x local) sheep is also kept on the farm.

The bulk of the farm buildings, and the general layout of the farm were designed by Dr. A. Lehmann when he was Agricultural Chemist. A considerable part of the total area of the farm is devoted to the work of plant breeding under the control of the Botanist.

The experimental work on the farm has related mainly to sugar-cane and paddy among wet crops and to ragi among dry crops.

The experimental work of the farm was preceded by a thorough scheme of standardising of the Experimental plots for a few years before they were utilised for the experiments, a feature seldom seen on any other farm in India.

The *experiments on sugar-cane* related to—

- (1) time of planting,
- (2) maturity of cane,
- (3) varietal tests,

- (4) manurial tests, and
- (5) spacing tests.

Moreover all the breeding work on cane of the Department has been conducted on this Farm.

*Work on paddy* has likewise related to—

- (1) manurial tests,
- (2) varietal tests,
- (3) green manuring,
- (4) seed rate,
- (5) age of seedlings,
- (6) duty of water, and
- (7) effect of ploughing after harvest.

*Work on ragi* has related to—

- (1) methods of sowing,
- (2) green manuring experiments,
- (3) mixed and pure cropping,
- (4) tillage experiments,
- (5) varietal and
- (6) manure experiments.

It was from the Hebbal Farm that the *short season groundnuts* which are now grown on thousands of acres in the State were first introduced into the State. In addition to these, several of the main season varieties of groundnuts for example, Sogatur, Virginia, Mauritius, Carolina, Transvaal, have been tested and much seed of the first two distributed.

A large *variety of implements*, ploughs of different kinds, and other tillage implements including the “Spalding deep tillage implement” seed drills, a potato digger for harvesting groundnuts, pumps and engines, threshing machines, reaping machine, etc., have been tried on the farm to determine their suitability to Mysore conditions. All the work in connection with the design and tests of the “Mysore” plough was conducted on the Hebbal Farm.

The results of all the experiments on the farm have been summarised in the Sections of the Agricultural Chemist and the Botanist appearing separately elsewhere. The bulletins of the Department on the cultivation of ragi and on green manuring describe in full and contain the results of the experiments conducted on these subjects on this farm.

The farm incidentally supplies a large quantity of seeds of the selected varieties of the different crops, principally sugar-cane, paddy and ragi.

### *The Marthur Farm.*

The Marthur Farm is situated in the interior of the Malnad near Talaguppe in the Shimoga District not far from the famous Jog Falls. It was opened in the year 1914 with the object primarily of experimenting on "Koleroga" of the arecanut, but was later developed to include experiments on the cultivation of the areca, paddy and sugar-cane and other crops suited to the *malnad* tract.

It is 56 acres in extent and fairly typical of the *malnad* areca and paddy area.

Work on the *koleroga of the arecanut* has related not only to the devising of the main remedy, *viz.*, the spraying with the Bordeaux mixture and the importation of a suitable spray pump, the Holder Sprayer which this Department was the first to get out but also to the different "Stickers", resin soda and casein, their preparation, time of application and so on. Extensive manurial experiments, *viz.*, the testing of the suitability of different kinds of green manure to this area of heavy rainfall, the use of artificial manure, the practice of growing and digging in green manure have been in progress. The results have shown that yields per acre can be increased by 50 per cent by the application of a mixture of groundnut oil-cake and superphosphate and of sulphate of potash. The growing of green manure between the rows of the areca palms, in preference or as an adjunct to the usual practice of bringing in leaves from the forest, the damage to which as a consequence has often been protested against, has been continued for many years with success on the farm.

Experiments on *sugar-cane* have related not only to the best varieties that could be introduced into this tract, but to the manuring and cultivation side of the question also. The thin Java cane has been found the best, both in the tonnage per acre and in the richness of the juice and above all on the suitability to the tract. Many of the seedling varieties raised on the Hebbal Farm which have proved a great success in other parts of the State have been found much inferior to the Java and hardly able to stand the heavy rainfall. Varietal trials are however a permanent feature of the farm work, new varieties being supplied by the Hebbal Farm. Among the latest varieties, one called H. M. 553 has been successful, and so has H. M. 315, a thin cane much like the Java, but tillering better. With this particular variety, *viz.*, the

Java cane, spacing experiments have indicated the desirability of closer planting for really heavy yields.

*Paddy* being the chief or the sole grain crop of the tract, a number of varieties suitable to the tract have been on trial. As a preliminary to more systematic work, the varieties have been purified and tested as to what extent they breed true. Promising individual selections and trials are to follow. A good deal of demonstration work on the economic transplanting of paddy which has been largely and successfully popularised in the *malnad* paddy areas was conducted on the farm in the earlier years.

*Pepper* being one of the most important of *malnad* crops, experimental work on this crop is carried on on the farm. A large number of varieties gathered from different parts of both Mysore and Malabar have been planted and some of the varieties have begun to yield. It is the object of the farm to propagate the best among the varieties and distribute to the neighbourhood as in the case of the other crops.

For demonstration purposes, the farm has also a silo. As in the wet season throughout the *malnad* there is a luxuriant growth of grass which does not admit of being cut and dried into hay, the practice of *silage making* has been deemed a desirable one to introduce in the *malnad*. On the farm excellent silage has been made in ordinary pit silos. It is expected that the example of the farm in this respect will be copied by the raiyats of the neighbourhood.

Attention is also paid on the farm to the introduction and testing of varieties of certain minor crops such as *ragi*, *chillies* and *plantains*. Two selections of *chillies* called C. P. I and C. P. II have also been distributed on a small scale through the *malnad*, as they are found to be good yielders suitable to these districts.

The farm has also an *orchard area*, on which several kinds of fruit trees have been planted to test their suitability to the tract, as in case of positive results a great deal of planting up of the waste land can be profitably recommended.

#### *The Nagenahalli Farm.*

The Farm was sanctioned in 1917 but it was not until 1920 that irrigation water was available when the terracing of the farm was taken up. No special labour being engaged, the work was done in instalments and in the year 1923 the whole farm was made suitable for wet cultivation.

The Farm is situated about 5 miles from Mysore. It was established as part of the sugar-cane development scheme, in the channel tract of the Mysore District served by the new Krishnarajasagara. The Farm consists of 60 acres made up of 45 acres of wet land and 15 acres of dry land. The situation being practically a low hill, the whole of the wet area has had to be laid into terraces, individual fields being only  $1/20$  of an acre in extent. The object of the Farm is to test the promising varieties of sugar-cane evolved on the cane breeding section on the Hebbal Farm as regards their suitability to the Mysore channel area and to multiply such varieties and supply seed, serving thus as a *sugar-cane seed farm*. Incidentally the farm carries out manurial tests of sugar-cane, experiments on the cultivation methods chiefly a rotation of sugar-cane and groundnuts instead of sugar-cane and paddy experiments on the planting seasons, weekly growth measurements throughout the growing season and demonstration of jaggery boiling methods.

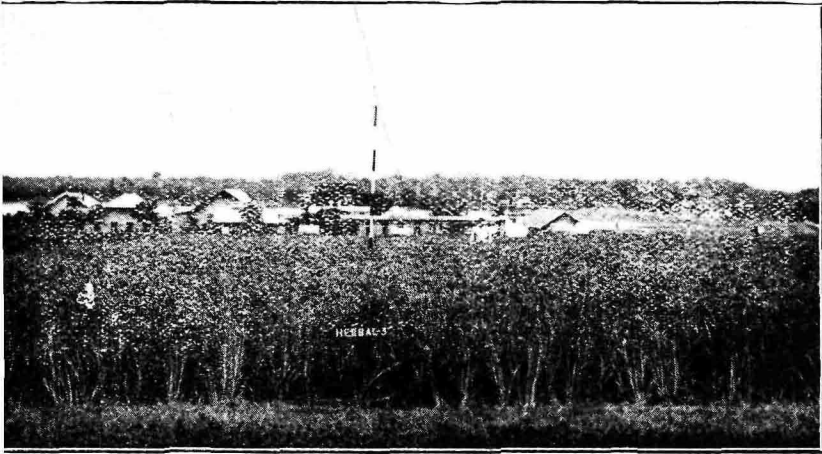
In addition to sugar-cane, paddy is also an important crop on the farm, as it is of the whole surrounding country. Varietal tests of district varieties of paddy have been continued and individual selections made from 11 of these varieties for further tests and multiplication.

Tests are also made of varieties of early maturing varieties of paddy suited to the main irrigation season of the tract

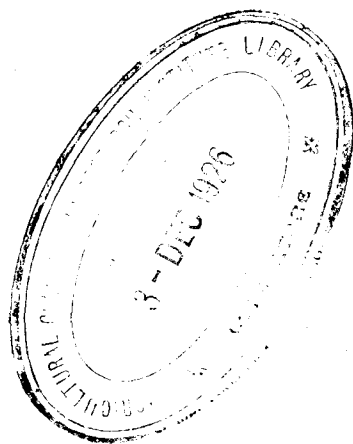
A large variety of *manurial experiments on paddy* has been in progress for some years, *viz.*—

- (1) the use of superphosphate alone and in conjunction with the green manures usual in the tract ;
- (2) the use of nitrogenous manures like sulphate of ammonia combined with supers ;
- (3) the use of ammonium sulphate with bonemeal ;
- (4) the use of oil-cake with supers ;
- (5) the value of basic superphosphate as against ordinary superphosphate ;
- (6) the value of the proprietary manure "Ammono-phos" of the grade 20—20 in comparison with sulphate of ammonia and super ;
- (7) the effect of varying proportions of nitrogen and phosphoric acid in the manure mixture ; and
- (8) the value of the lantana as a green manure as compared with sunnhemp and wild indigo.

As a result a manure mixture for paddy consisting of sulphate of ammonia and superphosphate has been largely



, THE HEBBAL FARM, SHOWING THE RAGI VARIETAL TEST PLOTS  
IN THE FOREGROUND.





advised in this neighbourhood. Superphosphate alone does not give profitable yields without the addition of nitrogenous manures. "Ammophos" gives very good yields and if it can be supplied cheap would prove a popular manure; and lantana can be profitably utilised as a green manure for paddy.

Until the last year 1924-25, the arrangements for giving the farm a hot weather supply of irrigation water were not complete and consequently sugar-cane was being grown under great difficulties. Nevertheless about 3 lakhs of setts of cane of the H. M. 544 and other varieties have been supplied to raiyats, who have taken seed setts to far distant places.

Practically the whole output of the paddy crop on the farm, especially the short duration varieties, is sold as seed to cultivators.

Among the medium quality varieties suited to the main season, the B. H. 24, and Coimbatore No. 1, both selections from Coimbatore Paddy Breeding Station have been found very high yielders, though the grain is rather coarse compared with many of the local varieties.

Banku as a fine short season variety has given high yields on the farm and has been largely distributed.

The farm has also milled sugar-cane for the raiyats of the neighbourhood in its power mill for a small fee in order to popularise the idea of a co-operative ownership of a power mill and engine by the raiyats themselves. Raiyats were permitted to cart their canes to the farm and use the Farm mill and boiling house.

The farm devised a cultivating tool for bullock draught combining a bladed hoe with an earthing up arrangement for work between rows of sugar-cane, cotton or castor, so that hoeing and earthing up may be combined in one operation. On the small terraces, which do not allow of the use of bullock drawn implements, the Planet Junior Hand Hoes are used for working between the rows of cane.

The farm has also introduced into cultivation the medicinal crop, *Baje*, "*acorus calamus*" into this tract, which bids fair to be taken up largely by the raiyats.

#### *The Babbur Farm.*

The Babbur Farm is situated in the Hiriyur Taluk of the Chitaldrug District, in the tract irrigated by the

(Marikanive) Vani Vilas Sagara irrigation system. It is also representative of the great black cotton soil country of that district on which the special crops grown are *jola* and cotton. The farm was therefore intended to demonstrate the cultivation of sugar-cane and other irrigated crops on a large scale as a measure of development of that new area, and also to study problems relating to the cultivation and improvement of the typical black cotton soil crops, cotton and *jola*. The tract is one of exceedingly poor rainfall, the average yearly rainfall being only about 18 inches. The area is also one where alkali patches abound, the trouble having also been aggravated by the new irrigation project. The problems facing the new farm are therefore peculiar to that tract.

The Farm comprises a total area of 200 acres, of which one hundred is irrigable while the remainder is all dry land. It is thus the largest among the Departmental Farms and the idea was to develop it as a large commercial undertaking by the growing principally of *sugar-cane on a large scale*.

The crops grown on the farm are sugar-cane, Cambodia cotton, and plantains on the wet area and "*sannahatti*" the local cotton and *jola* on the dry area. Sugar-cane has been grown only over an area of from 20 to 30 acres, the principal reason being the unsuitable nature of the soil, which is wanting in depth and is greatly in need of drainage. A thorough system of open drains has greatly improved the soils after several years of continued attention and this served also as an object lesson to the neighbourhood. *Manurial and varietal tests on sugar-cane* are carried on, the former indicating the need for cattle or organic manures for these soils which could not be altogether replaced by artificials though the latter in conjunction therewith have given greatly increased yields.

The varieties J. 33 A and H. M. 544 having done very much better than the local canes *Rasadali* and *Pattapatti*, these are being largely grown on the Farm and also distributed in the locality.

The Farm owns a *large power crushing plant* and a battery of three open pan furnaces for boiling down the juice into jaggery. Wood fuel has altogether been dispensed with and the jaggery boiling charges greatly reduced thereby. The whole arrangement serves as a demonstration of large scale methods in the tract.

A large area was put under plantains more or less as a nurse crop to the young *cocoanut plants* of which a plantation is being raised. The cocoanut is becoming a popular crop in this locality, and this area on the Farm under cocoanuts was put down to study manurial, cultivation and other problems relating to that crop. A large number of varieties of plantains were planted and the result showed that the most profitable variety to plant was the "Poovan" of Coimbatore, the so called choice varieties not proving suitable or at all as good as this variety. Cambodia cotton is grown as a bulk crop, from which the large seed supply for this tract is derived.

On the dry land, the most important work has been *breeding work* in regard to the local "*sannahatti*." As the result of this work, Selection No. 69 has been evolved, which is superior in length, colour and uniformity of staple and ginning percentage to the local variety and also yields well under dry conditions. This variety has been distributed largely through the District Staff of the western division, the area in the year 1925-26 being about 15,000 acres.

The farm is also equipped with a *large power gin*, in which all the farm cotton is ginned pure for seed purposes. A great deal of the raiyats' cotton is also brought to the farm gins and the return by way of ginning charges amount to a substantial sum in certain years. In 1923-24, the farm earned over Rs. 2,000 as ginning charges.

The farm also possesses an Austin Tractor and Tractor ploughs and disc harrow for work on the farm and for hiring out.

In addition, the farm has taken up the *breeding of crossbred sheep* as experience showed these sheep thrive well on this farm; the supply of crossbred rams for raiyats' herds will be possible very soon from the farm herd.

The farm also maintains a stud bull for service to the surrounding villages.

Recently, *sericulture* has been started on a small scale and a special assistant appointed; if the rearing of worms becomes a success on the farm, the prospects for an extension of this very profitable industry should be very bright.

Just in the same way as the other Government Farms, the sale of seeds of different kinds is a very large item of the work; on the average a lakh of sugar-cane setts,

hundred maunds of Cambodia cotton seeds and 50 maunds of the selections and varying quantities of paddy and jola are being supplied annually.

*The Balehonnur Coffee Farm.*

This Farm which has been the latest to be started was sanctioned only in the year 1925. The circumstances of its origin and the kind of work proposed to be taken up may be briefly described here, principally as an indication of what the farm is expected to accomplish.

The investigation of the many and pressing problems relating to coffee cultivation—such as cultivation methods, manurial requirements, the testing of varieties, the breeding and propagation of high yielding or otherwise desirable varieties, the insect pests and fungoid and other diseases of the coffee—has been on the programme of the department from its very inception. As may be seen from the results of the work accomplished by the different scientific sections, the chemical, mycological and entomological work on coffee problems has bulked very largely during the whole period and continues to do so to an increasing extent. The whole of the work on these lines has had to be conducted only on the estates of planters who in spite of great inconvenience to themselves have cheerfully co-operated with the staff of the Department. It has been felt that a special Coffee Experimental Station completely under the control of the Department, with a suitable staff, resident on the farm, and proper equipment by way of a laboratory for scientific studies on the spot could alone ensure that amount of efficient attention that the coffee interests of the State really demand. The matter was gone into thoroughly both by the Mysore Department of Agriculture as well as the general body of coffee planters both in and out of Mysore, and with the co-operation and support of the planting community the opening of a Coffee Farm was urged upon the Government. One of the special features of the scheme was the levy of a special cess on all the coffee growing areas, from which the small planters owning not more than five acres were, however, exempted. This levy of the cess was finally decided by the Government after a great deal of consideration and consultation with the planters' representatives. The opening of the farm was duly sanctioned in the current official year and a sum of Rs. 30,000 provided in the budget.

The place selected for the farm is near Balehonnur in the Kadur District, the heart of the coffee region, with an elevation of 2,500 feet and a rainfall of 100 inches.

The area of the farm will be about 180 acres eventually. The preliminary work of clearing, making roads, construction of buildings, planting of nurseries and other work has only begun; a nucleus of bearing coffee on which experimental work can be taken up at once and carried on while the farm is itself being planted and brought into the bearing stage exists in the 15 acres of bearing coffee adjoining the farm which is a free gift to the farm due to the generosity of Mr. Crawford. It will be possible therefore to begin the actual work of investigation of various kinds immediately.

*Other farms under consideration.*

Two other farms one a *cocoanut farm* in the Tiptur tract for the study of the cocoanut, and another a large sugar-cane farm for growing sugar-cane on a commercial scale to be located in close proximity to the Krishnarajasagara Dam are proposed to be opened at a very early date.

## CHAPTER VI.

**Extension, Popularisation or District Work.**

**Staff and Equipment.**—The work of extension and popularisation of improvements in agriculture is in the hands of the Deputy and Assistant Directors who are assisted by a staff of Agricultural Inspectors and Fieldmen. The State is divided into two Divisions; the Districts of Mysore, Bangalore, Kolar and Tumkur constitute the Eastern Division under the charge of the Deputy Director, and the Shimoga, Chitaldrug, Hassan and Kadur Districts constitute the Western Division in the charge of the Assistant Director. The Headquarters of the Deputy Director is Bangalore and that of the Assistant Director is Shimoga. The number of Agricultural Inspectors has increased gradually as the work developed and trained men became available until at present there are 13 in the Western Division and 14 in the Eastern Division. As the total number, *viz.*, 27 falls short of the number of taluks in the State which are 78 in number, each of the Agricultural Inspectors has two or more taluks in his charge depending upon the size and importance of the taluks. Under the Agricultural Inspectors work the Fieldmen who are to carry out the actual field operations in the various items of demonstration work.

Each of the Agricultural Inspectors has an office and a depot where manure, seeds and implements recommended by the Department are stocked for sale. Agricultural Inspectors are also supplied with a set of improved implements such as plough, cultivator, harrow, sugar-cane mill, etc., for being taken out and worked on raiyats' fields as demonstrations.

**Methods of Work.**—The popularisation of improvements is carried on in a variety of ways but the greatest importance is attached to the only efficient method, *viz.*, that of *ocular demonstration*. All improved implements are shown at work side by side with the local implements on the raiyats' own holdings. Sufficient interest is aroused and co-operation enlisted to induce respectable raiyats to carry out on a small scale one or other of the various recommendations of the Department. It may be the trial of a new variety of crop, of a

new manure or manure mixture, of a new method of seed selection, a new method of planting, of treatment against pests and diseases and so on. Such areas serve the purpose of demonstration plots for the neighbourhood carrying conviction not only to the actual cultivator concerned but also to his interested neighbours. The success of the staff is judged by the extent to which the raiyats' confidence is enlisted and the number of such demonstration areas increased. From these as nuclei, the improvements spread and the district staff takes all possible means to give publicity, to supply the seeds or manures required, to supervise and advise, and to steadily widen the area of each improvement.

The name of every person who thus undertakes any of the recommendations is borne on the *Clients' Registers* of the Inspectors who are to watch the progress, to see that the methods are permanently adopted, to look into and attend to repairs or renewals of worn parts of implements, in fact to keep in frequent touch with such agriculturists. No opportunity is missed to address meetings or gatherings of raiyats, to hold ploughing and other demonstrations suitable to the seasons, and bring the recommendations to the notice of the people; at the various '*jatras*' and cattle fairs, the larger weekly fairs, at *Jamabandi* gatherings, at the meetings of Co-operative Societies and at the numerous District, Taluk and Hobli Conferences, the Agricultural Department is in evidence, lecturing, demonstrating and exhibiting.

For all the materials such as manures or seeds supplied for the demonstration areas, it should be said to the credit of the raiyat, he pays cash, so that these cost little or nothing to Government. It is only in very exceptional cases or with any special funds that may be provided by Local Bodies who may be anxious to speed up improvements in their tract that any of these articles are given free or at concession rates. The object of Government Farms is thus secured more efficiently, more cheaply and to a very much wider circle of raiyats than may ever be possible by the opening of Government Demonstration Farms here and there in the country. The various lines of work along which the district staff reports progress from month to month will be seen from the diary heads prescribed which is given in the appendix.

The bulk of the work accomplished along the main recommendations may be summarised as below, the figures

covering the 12 years beginning 1914 when this Section was constituted unless otherwise specified.

**Inspection of Estates, Advice and Clientele.**—The Department has succeeded in inducing raiyats to resort freely to the depots for advice regarding the improvement of estates. It can be claimed that there is no landholder of any importance whose land has not been inspected by the staff. It is a sign of the times that a number of English educated landholders and others are beginning to look to the land for a career, are acquiring new land or taking up the cultivation of their own land into their hands and avail themselves of the advice of the Department relating to land improvement, irrigation, drainage, cropping scheme, farm machinery, manuring, remedies for diseases, etc.

### Implements.

The demonstrations of improved implements are of course, too numerous to specify. The result has been the sale of the improved ploughs, cultivators, harrows and spare parts of ploughs in large numbers from year to year. The number of these implements sold in the State from year to year is given below :—

<i>Year.</i>	<i>No. of imple- ments sold.</i>	<i>Year.</i>	<i>No. of imple- ments sold.</i>
1910-1914	... 746	1920	... 771
1914	... 613	1921	... 879
1915	... 1,551	1922	... 1,033
1916	... 1,129	1923	... 269
1917	... 1,600	1924	... 577
1918	... 978	1925	... 2,009
1919	... 981		

The number of spare shares supplied amounts to 13,575. This number of ploughs and shares represents only what has been sold through the departmental depots and does not include sales through private agencies.

Were it not that the two years 1923 and 1924 have been years of poor rainfall and even acute distress, the sales would have been very much more. As regards the type of ploughs sold, there is a great variety; the Kolar Mission plough is the most popular; in the black cotton soil districts a heavier plough is required and the Verity plough—



a first class plough manufactured by Massey Harris Company of Canada—and a heavy plough manufactured by the Kirloskar Brothers of Satara are sold largely; in the *malnad* and in the paddy tracts of the channel areas smaller ploughs called the “Eureka” and the “Meston” both small, one-handed mouldboard ploughs are supplied.

The share renewal of the Kolar Mission plough which is now being sold largest is always an expensive charge; but local blacksmiths have been encouraged to weld new pieces to old shares and to make a fair imitation of the share itself. The Government Central Industrial Workshop has also undertaken the manufacture of cheap shares. Kolar Mission ploughs and cultivators are also made and sold by more than one village blacksmith, the “frog” or foundation of the plough being cast and sold by foundrymen in Bangalore.

**The “Mysore” Plough.**—To get over the “share” problem, the Department has tried several methods. The “slip point” share was imported and still enjoys some vogue. Later, the “Syracuse” plough which has a bar—point arrangement—was imported but was found unsuitable both on account of its weight and the material, *viz.*, cast iron, of which it was made which led to breakages. Later, a cross between the Kolar Mission and the Syracuse was attempted combining the bar point feature of the latter with the lightness of the Kolar Mission and the result is the “Mysore Plough.” After several alterations as the result of trials by and suggestions from the members of the Agricultural and Experimental Union, it emerged in its present design, and was got out manufactured in England. The number sold during the past two years is 173; it is still, however, only in the experimental stage.

**Cultivators.**—Along with the improved plough, the “six shovel cultivator” is being popularised for working the land after the ploughing. Being only a local made implement, it is being copied widely by many villages, and is also made by the Government Central Industrial Workshop. In the Western Division, the Assistant Director is making and supplying a smaller cultivator of the same model for draft by small sized bullocks. The “cultivator” is being made use of not only to follow the plough but also for covering seed and for even the harvesting of groundnuts. There are a large number in use, but those sold through the depots is 912.

Trials of and enquiries about large scale implements such as tractors, tractor ploughs and disc harrows have been attended to by the staff, but only a few large land-holders own these outfits and use them successfully. These outfits are, however, the subject of frequent inquiries and correspondents are always put into touch with the few clients of the Department who are using the outfits.

**Threshing Machines.**—A threshing outfit consisting of a small  $5\frac{1}{2}$  H. P. oil engine and a "Pensylvania" threshing machine was demonstrated for the threshing of *ragi* largely in the villages and was also worked for hire at about six annas per palla of *ragi* threshed. Only about half a dozen land-owners are owning these outfits. As even this small outfit is found too large for even the larger agriculturists and as co-operative ownership and use was too difficult to secure, the matter was not pushed further.

Meanwhile the stone threshing roller being found a great improvement over the old methods and suitable for individual ownership, that implement was taken up for the threshing of *ragi* and *jola*. The number of these has increased with astonishing rapidity and the demand has opened out a new occupation for the stone "woddars" at many of the quarries in the State. There is no threshing floor now, especially in the Eastern Districts, where it is not in use. In the *malnad*, the roller is coming into use for the threshing of paddy also. The demonstration of a heavy implement like this and its supply for sale in waggon loads has been an arduous work for the District Staff.

It has not been found possible to get a record of the total number in use, but it certainly cannot be less than 20,000 in the State. It has certainly become sufficiently common and important to be included as a separate item in the Quinquennial Census of Agricultural Stock in the State.

**The Disc Harrow.**—The disc harrow is being recommended not only for its well known uses but also for stirring the soil after the *ragi* harvest, when the soil hardens generally and makes ploughing difficult. Experiments have established the great usefulness of this ploughing, and the discing with the disc harrow is recommended as an alternative. Each Agricultural Inspector's depot keeps one such for being hired out. Only a few have

been sold as the high cost is against its being bought by the average farmer.

**The "Nahan" Sugar-cane Mill.**—More strongly built than the sugar-cane mills in ordinary use, capable of an increased extraction of about 10 per cent, and singularly free from the annoying and frequent breakdowns incidental to the local mills, this "Nahan" mill manufactured by the Nahan Foundry, Punjab, was tested and recommended by the Agricultural Department. Through these 12 years a very large number of demonstrations have been held all over the State, as the Agricultural Inspectors are provided with a mill for demonstration purposes. As a result the number purchased by raiyats from year to year has steadily increased. At present the number in use in the State is not less than 500; it speaks volumes for the responsiveness of the Mysore raiyat to genuine improvements that this large number should have been sold notwithstanding the fact that these mills cost twice as much as the local mills. This type is now being manufactured with materially improved features by Messrs. Madurai Mudaliar & Sons of Bangalore City. The Government Central Industrial Workshop also manufactures the same type of mill and they are also being sold quickly; Messrs. Petrie Hay & Co., another foundry in Bangalore, is also turning out similar mills. The whole demand which this supply is seeking to meet has been created by the work of the District Agricultural Staff.

### **Manures.**

**Cattle Manure.**—The improvement in the quality of cattle manure by better methods of collection and conservation, both by alterations in the construction of cattle stalls and in that of the manure pits, is one of the recommendations which the Department is incessantly urging. Model cattle stalls and manure pits exist on the Government Farms to which the attention of all visitors is drawn; and at the larger exhibitions similar stalls and pits are put up for demonstration. Although it has not been found possible for many to adopt these recommendations in their entirety owing to difficulties of a non-agricultural character, still a large number have adopted either the one or the other. The provision of water tight floors with gutters in the stalls has been largely adopted, some of the large landholders having the floor stonepaved;

only a few, however, have taken to the improved manure pit construction. The question is connected to a certain extent with the extension of the village sites.

**Green Manuring.**—The practice of growing green manure crops on wet lands and in garden lands for being ploughed in as manure being one of the cheapest ways of improving the soil, and as the result of a large series of experiments on the Hebbal Farm have shown that the sunnhemp crop has been found the most suitable, this has formed an important item of district work. Where the difficulties due to stray cattle are serious the green manure "*Crotalaria Striata*" has been recommended. In the areca gardens of the *malnad*, recent experiments have pointed to *daincha* as an excellent crop for green manuring. In the cocoanut gardens of the Tiptur Taluk, sunnhemp is being recommended and grown largely. The green manure seeds are stocked and sold from the Agricultural Inspectors' depots. A quantity of 165,000 seers have been supplied through the Department so far, while a large number of people procure seeds independently. One of the results on the Hebbal Farm relates to the value and possibility of growing a green manure crop on dry lands prior to the main ragi crop itself for ploughing in as manure. It has not been found possible to induce raiyats to look upon this with favour, due no doubt, to the insufficient rainfall apprehended.

**Oil-cakes.**—Among concentrated fertilizers, the first to be taken up in the earlier years of district work was oil-cake, especially for use for the sugar-cane crop. At that time there were important sugar-cane areas where the use of oil cake was either unknown or was not in vogue. Further, even in places where it was known, custom prescribed only *hongey* and castor cakes and the groundnut oil-cake was new and therefore as usual, tabooed. A strenuous campaign was therefore set on foot to introduce the use of these oil-cakes including the groundnut cake, which was generally becoming more and more plentiful, all over the State. The Department itself stocked the manure in huge quantities and sold it to the raiyats sometimes for cash and more often for credit. The usual indifference and unwillingness was slowly overcome, and at present in villages where not a maund could be sold even after months of persuasion, groundnut oil-cake itself is bought in hundreds of maunds. So thoroughly common has it

become that the Department has completely ceased to stock and sell it at all, all the demand being met by manure dealers in different parts of the State. The quantity sold by the Department up to the year when we ceased to stock it was 3,616 tons. Furthermore, while we found it hard to persuade raiyats to manure a valuable crop like sugar-cane with oil-cake, at present the raiyat readily takes it, if advised for dry crops like ragi. Oil mills of modern types driven by oil, steam or electric power have come into existence in Bangalore, Mysore and Davan-gere while one Company in Tumkur installed machinery for the extraction of oil by solvent process using benzine and petroleum spirit. Added to the output from the old bullock driven village mills, there is thus at the present time a very large supply to draw from.

**Sulphate of ammonia.**—For the past five or six years the use of sulphate of ammonia in addition to the oil-cake *manuring of the sugar-cane has begun to be advised*; the beginning was very moderate not only because it was new but also because it was very costly. More and more demonstration areas were put down, the sulphate too became cheaper, and with special aids such as the giving away of prizes in the shape of sulphate of ammonia instead of cash or medals at the Conferences, the use of the manure was extended. Once the effect of the manure was actually seen here and there in the various villages the demand rose by leaps and bounds. The quantity sold in the last few years is noted below :—

	Tons.		Tons.		
1917	...	$\frac{3}{4}$	1923	...	21
1921	...	$3\frac{1}{2}$	1924	...	41
1922	...	25	1925	...	97

At the present prices, sulphate of ammonia furnishes nitrogen in a cheaper form than the groundnut oil-cakes, and the use of the manure is being taken up for all kinds of crops. The use has so greatly been stimulated that the suppliers themselves have taken up the work of opening sale depots with their own staff and have appointed propagandists to work along lines suggested by Department. Messrs Shaw Wallace & Co., have thus opened six depots in the State, appointed five Fieldmen to work under the Agricultural Inspectors, appointed also a superior staff to get into touch with Co-operative

Societies and the larger growers and also agreed to accord concession rates to large purchasers, Co-operative Societies and Village Panchayets.

**Superphosphate, Bonemeal and other Fertilisers.**—The introduction of phosphatic manure in the districts arose first out of the necessity for supplying a suitable manure mixture for paddy for the Mysore channel tract, where manure was scarce and seldom applied though on account of the assured water-supply there was great scope for its profitable and liberal use. In the earlier trials bonemeal and oil-cake mixtures were used, then supers and oil-cake and now the general mixture is that of supers and sulphate of ammonia. The question of the cost of the manure per acre being all important, other things being equal, this fact had to be kept in view and the ingredients chosen accordingly. Little by little the use has increased and extended to many paddy growing tracts of the State.

The raiyats having been thus generally accustomed to the use of artificial manure for sugar-cane also, a mixture of both super and ammonium sulphate is advised and the advice is beginning to be adopted. As the years go by the use of phosphatic manures for paddy and sugar-cane and other crops is bound to become as general as the nitrogenous manures themselves bid fair to become.

Although paddy and sugar-cane are two main field crops that account for the bulk of the sale of these manures, other crops like cocoanut, potato, chillies, onions, and even ragi and groundnut are beginning to be manured likewise. The work is however, pursued with caution, and only as results of small scale trials indicate the suitability or otherwise of different mixtures.

The progress in the sale of artificial manure of all kinds during these years for agricultural crops may be seen from the following table:—

	Tons		Tons.
1920-21	... 14	1923-24	... 66½
1921-22	... 86	1924-25	... 425
1922-23	... 63½	1925-26	... 333

In fact nothing so strikingly proves the utility and need for a District Agricultural Staff than the fact, that although prior to 1914 the Mysore raiyat was aware

of the fact that these manures were being used largely on the coffee plantations, although huge quantities were imported into Mysore and bone-crushing factories too existed in the State both in Hunsur and Bangalore and although in the laboratories of the Department the most laborious analytical work was being done chiefly on artificial manures, little or nothing of it was used for any of the field crops, the raiyat not wasting a thought on it as something good for his crops also. In this as well as in many other lines of improvement work, the progress will be in proportion to the strength of the staff.

### Cultivation Methods.

**Ploughing Dry Land After Harvest.**—The advantage of ploughing dry land soon after harvest an important practice in dry farming has been explained widely and also demonstrated. In spite of the difficulties of carrying it out in years of poor rainfall, the practice is now followed in a great many villages, the increasingly large area under groundnut making the practice less difficult on account of the loosening of the soil after the harvesting of the groundnut.

**Seed Selection.**—The selection of seed on the field itself by the selection of the best earheads and later by the floating out of inferior grains by the salt water method, in the case of ragi and paddy has been widely adopted as the result of the easy nature of the method and the large number of demonstrations every year; through the staff alone 1,200 seers on the average are selected for the raiyat every year in this manner. Some of the larger raiyats have been induced to take special pains to ensure pure seed selected from first class earheads.

**Economic Transplanting of Paddy.**—One of the earliest recommendations has related to the economic transplantation of paddy, especially in the *malnad* area where the practice has been to plant in bunches of even a hundred seedlings to the clump. Due to the persistent work of the District Staff, this large number has been reduced to as few as about 5 or 6 and on thousands of acres the improvement has now been adopted. Even in the Maidan tracts the same work has been carried on in order to reduce the seed rate sufficiently low to bring the seedlings from 6 or 7 down to 2 and 3. In the first years of the campaign, special staff was told off for this work in the channel areas,

demonstration plots were laid out in a large number of villages and the raiyats' transplantation coolies also trained and supervised. In this way a general reduction of the seed rate has been brought about throughout, although even a further reduction can take place without a reduction in the yield.

**Wider Planting of Sugar-cane.**—Experiments on the Hebbal Farm conducted over many years having demonstrated the advantage of planting sugar-cane in rows three feet apart or even four feet apart in preference to the raiyats' method of planting it 12 to 18 inches apart, the practice was recommended for general adoption. There was great disinclination at the outset to widen the rows, but the example of many important clients of the Department who were induced to make a beginning had great effect. In the important cane growing Districts of Kolar, Bangalore and eastern Tumkur, the practice has become very general, many of the extra-cautious raiyats feeling their way so to speak, and increasing the distance gradually from year to year.

**Jaggory Boiling Methods.**—Improvements in the methods of jaggory boiling have occupied attention from the very beginning as a great deal of scientific work was being done both at Hebbal and in the laboratories on this subject as may be seen from the Report of the Agricultural Chemist. Better mills, ripe canes, clean handling of juice, the use of the litmus paper for judging sufficiency of lime, the use of metallic ladles for skimming, and above all a fuel saving furnace, all these are widely popularised. It will be no exaggeration to say the staff visits practically every jaggory boiling house during the season for this work.

Litmus paper books are stocked and supplied by the depot. Brix spindles to test the ripening of the cane are also kept for sale, metallic ladles have been sold in hundreds, and improvements also introduced in furnaces by the provision of fire bars and chimneys. The use of a double pan furnace to economise fuel has been demonstrated but it has not become general, being in use only in the estates of a few larger clients.

**Areca Drying.**—The drying of the arecanut and cardamoms has likewise been improved by the use of a special imported drying furnace and of a local imitation of that dryer with the use of local materials. In the *malnad*, the staff has erected many such drying furnaces



for raiyats and the great improvement in the quality of the produce especially when drying has to be done in the middle of the monsoon season, is being greatly appreciated.

**New Rotations.**—The changes in crop rotation that are being popularised as the result of work on the Hebbal Farm are (1) the rotation of ragi with groundnuts and (2) the rotation of sugar-cane with dry or semi-irrigated crops like ragi, groundnut or garden crops. The former has become general over very large areas during the last few years, the work by the staff being reinforced in this regard by the rapid increase in the areas under groundnut crops.

The second recommendation is one that is greatly welcomed and appreciated, but owing to certain complication in that the raiyat is often merely a tenant having to grow specified crops especially paddy and in other respects also not being an independent agent, it has not been found possible to extend it materially. Cultivators who farm their own land and whose land itself admits of such a rotation, have, however, taken to it eagerly, having realised its excellence.

### **Crops.**

The work of the District Staff in this section relates to the arranging for the large scale district tests of the varieties evolved and put out by the Farms as superior varieties, and then the extending of the area under these varieties and of similar work with regard to new crops altogether.

The work can be reviewed under the following heads:—

**H. 22 Ragi.**—This strain was put out for district trials and distribution about six years ago as a variety which gives about 20 per cent increase over the other pure strains tested. District trials have generally borne out this claim and through the usual methods of extension, the area has increased by leaps and bounds; the districts of Bangalore, Tunkur and Kolar, and the eastern part of the State generally are the tracts where the largest areas are now grown. In many villages, the variety has completely displaced the local varieties that used to be grown. The distribution of seed was entirely in the hands of the District Staff in the beginning, but gradually as the areas increased large quantities of seed were available with the villagers themselves from whom seed is to a great extent taken for cash or exchange of grain by new villagers. The total area in the two Divisions under this crop may

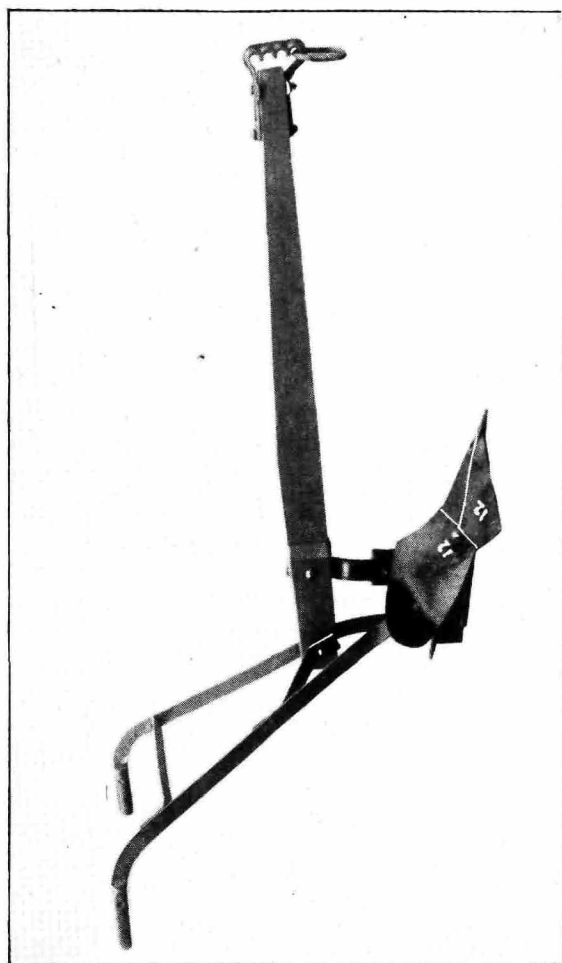
be estimated at not less than 100,000 acres. This extension has not altogether been smooth sailing, areas have waxed or waned, the variety gaining in one place and losing elsewhere as against local varieties, but the result has been a steady and rapid increase.

**H. 22 Ragi Seed Farms.**—The departmental seed supply now relates to that of pure seed from the Hebbal Farm to selected clients in the districts. The crops of these gentlemen are grown on well-prepared areas, accidental mixtures, if any, are rogued out and the crop harvested and threshed separately to avoid mixtures. The grain used to be bought at a premium of 10 per cent over current prices for general distribution. Even this concession in price has now been withdrawn. Through these seed farms the department sends out every year a steady stream of pure seed and tries to prevent the tendency to mixtures which is inevitable in the ordinary raiyats' lands and if not checked in this way would become so serious as to undo the result of all this work.

As a further matter of encouragement, a system of *standing crop competition* was organised and carried out for three seasons. The raiyats who grew the best areas in individual taluks, as judged by the officers of the department were awarded special medals of three grades, at the Annual District Conferences. In the third year of the scheme, the medal prizes were replaced by packets of sulphate of ammonia, thereby securing the double object of encouraging H. 22 ragi cultivation as well as of starting the popularisation of the new manure. This work has not a little helped in the publicity given to the variety, and was carried out by subventions granted by the District Boards of Bangalore, Tumkur and Kolar.

**Short Season Groundnuts.**—The story of the variety which matures in  $3\frac{1}{2}$  months is also of equal interest. This has enabled the ryot to raise two dry crops in the year over large areas and it has meant a catch crop of as much money value as a main crop on the paddy lands. In the Chitaldrug District and in the Mysore District the largest areas exist, totalling at present about 75,000 acres, or half of the whole area under the groundnut crop in the State. The whole of the vast area is the result of a few bags of seed with which at the beginning of the campaign the District Staff started out on the work.

**Sugar-cane.**—District work on sugar-cane has related to the introduction of the cultivation of the crop into new



THE MYSORE PLOUGH.

areas and to the displacement of the old varieties by more promising varieties. In the earlier part of the work, the local varieties were themselves extended into new areas. The second stage was the distribution of the Red Mauritius and J. 33 A over very wide areas in the *malnad* especially. In this region the area under the varieties amounts to 2,000 acres and 1,000 acres, respectively.

With the starting of cane-breeding work on the Hebbal Farm several seedling canes tested and recommended by the Farm became available, and as in many respects one of these, *viz.*, H. M. 544 was found very superior, the popularisation of this variety was taken up. Others of similar merit were, *viz.*, H.M. 320, H.M. 310 and latterly H.M. 553. The first, *viz.*, H.M. 544 being a white cane and a heavy yielder and a hardier cane than the *pattapatti*, has made a good impression in all the places where it has been tried. Its most notable success is in Bannur, the most important centre of sugar-cane cultivation in the Mysore District. The variety has however been established now in all sugar-cane growing centres in the State, and its extension over wide areas may be looked forward to with confidence. The extraordinary giant-like growth of the new cane is the special character which accounts for the heavy tonnage per acre.

The total area under the variety may be put down at 500 acres in the whole State, but the point to notice at the present stage is that this area is made up of a large number of blocks situated all over the State; there is no sugar-cane growing village of any importance where the cane has not been introduced.

The chief effort in regard to cane distribution is to establish seed centres, as the transport over long distances is not only expensive but damages the seed setts very much. Seed setts in addition to being sold outright to ryots are issued on the understanding that half as much more setts are returned at milling time, so that the ryot is saved a money payment and the department is enabled to carry out further distribution to neighbouring centres.

**Paddy.**—Work on paddy seed distribution relates to the early maturing varieties which are at the same time high yielders. The work of systematic testing of District varieties is undertaken at Hebbal and Nagenahalli for the plains and Marthur for the *malnad*.

The demand is always very great for these varieties, and the Department is seldom able to meet it fully.

Recently the Nagenahalli Farm which grows about 35 acres of paddy altogether has been able to reserve the whole of its output for seed purposes. The varieties that have been most distributed of this kind are *banku*, *Chintamanisanna*, *halubbalu* and *kapilesanna*. The total quantity sold through the department amounts to 1,624 pallas. That the ryot is able to raise a paddy crop to maturity even when the supply of water is not plentiful in the tank is the special beneficial feature of this work and it will have to continue, because most tanks and other water sources are of this category.

Among the main season paddies, the most notable have been two Coimbatore selections, B.H. 24 and Co. No. 1; a few pounds of these were got out and tested on the Nagenahalli Farm and the yields were so encouraging that it spread to the areas close to the farm, and later in the current season has been very largely taken up mostly in the channel areas of the Mysore District. The seed has been distributed on a comparatively small scale throughout the two Divisions, and the extension or otherwise of the area will depend upon its performance in these centres.

**Cotton.**—Work on cotton in the earlier years related to the trial and introduction of the Cambodia cotton, the Dharwar-American cotton, "Broach" cotton and of certain "Nandyal" selections of the Madras Department of Agriculture. The first, namely, Cambodia cotton has become now well established in the Marikanave tract and in the taluks of Sira, Challakere and Chitaldrug principally where irrigation is available. The Dharwar-American cotton has also extended in area and as it is not partial to the black cotton soils on which alone the local cotton grows, it has extended to red soil areas over many taluks in the Western Division.

After the opening of the Babbur Farm, systematic cotton-breeding work was begun and a strain called Selection No. 69 has been put out. The large scale trials of the last two years on ryots' holdings have been strikingly in its favour and it only remains now to arrange for large quantities of pure seed and for its distribution much on the lines of the H. 22 seed ragi work. In the season 1925-26, the whole of the cotton of certain growers was ginned in the departmental gin and all the seed was readily taken up. The quantity supplied thus has been enough for sowing about 15,000 acres.

In regard to the Dharwar-American and Cambodia cotton one of the chief troubles is the "Red Leaf Rust" disease which causes leaves and bolls to redden and drop and which often assumes serious proportions. Were suitable remedial measures devised the extension will go forward over many a new tract, for, as a money crop, the cotton is one of the easiest and cheapest to grow and market.

**Potatoes.**—Among the various other crops handled by the District Staff must be mentioned the potato. One of the chief troubles with the crop is the "Ring Disease." This was first studied by Dr. Coleman and its true nature established by him; diseased seed and infected soil were found to be the cause of the appearance of the disease in the crop. There has always been a great demand for disease-free seed, and the department got out two new English varieties "Up-to-date" and "British Queen" which, grown and multiplied in the estates of selected clients, is being distributed to growers. The latter of the two however has been found more suitable and distribution has been confined to it accordingly.

The Agricultural Inspectors' depots stock and sell seeds of vegetables and try as far as possible to obtain for ryots seeds of any other crops or varieties that may be desired.

**Relief of Fodder Distress.**—On the District Staff also falls all the executive duties of the department. For example, for the past two years the staff carried out operations connected with relief of fodder distress. This consisted of the purchase of fodder from the surplus in the channel tracts, transport to central straw yards in Bangalore and Goribidnur, the installation and working of electrically-driven baling machinery, and the sale of the fodder. A system of marching camps on the route of march of cattle from the distressed tracts to the Malnad where fodder and water was available was also undertaken. Prickly-pear utilisation camps were also run in many villages. These operations costing a large sum of money and the employment on strenuous duties of practically the whole District Staff entailed an enormous amount of executive work, purely outside the normal technical duties of an agricultural staff.

**Work in conjunction with Co-operative Societies.**—The District Staff has also from the beginning interesting the Co-operative Societies to take up the stocking and sale of

agricultural implements, seeds and manures, and the members of the societies to take up one or other of the recommendations of the Department. A number of societies have thus been induced to purchase and keep implements like improved ploughs and sugar-cane mills for hire and for demonstration and many societies have also invested substantial sums in the purchase of implements and manures for sale to members. In both the Divisions taken together 200 Societies are engaged in the work. Two societies have been formed as purely jaggory-boiling societies, owning mills, pans and accessories for the use of their own members.

**Village Panchayets.**—Likewise in recent years, especially in the Mysore District, depots for the sale of implements and manure have been opened by certain Village Panchayats. Such Panchayats have invested a capital of Rs. 200 to Rs. 500 each, and the sales are of growing magnitude. It is proposed to enlist other Panchayats in similar work. The District Staff is also in close co-operation with District and Taluk Boards and have succeeded in persuading them to grant material financial assistance for the encouragement of work in their respective areas. The District Board of Mysore is the most notable one which grants subventions for encouraging green manures, silage-making, artificial manures, new varieties of sugar-cane, the keeping of cross-bred rams and other useful items of work. The District Staff also assists in the work of the other sections of the Department bringing outbreak of cattle disease or plant diseases to the notice of the respective officers, helping to secure disease-free silk worm eggs or mulberry cuttings from the Sericultural Department and generally rendering all assistance required by the other sections in the District.

**Depot Sales.**—The total transactions of the Agricultural Depots are steadily growing and amounted to about a lakh of rupees in the year for all the 27 depots together. This does not include sales from the manure depot of the dealers themselves.

**Clientele.**—The number of clients of the department who have been carrying some item or other of work along improved lines as recommended by the Department and with whom the staff is in touch is over 50,000 which takes no note of the hundreds of ryots who buy their manure or seed independently from dealers or from their fellow ryots.

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## CHAPTER VII.

### **Agricultural Education.**

(a) **Higher Grade.**—The Hebbal Agricultural School giving a two years' course in agriculture was started in the year 1913, with provision of the training of about fifteen students per year. The instruction is all imparted in the English language and is of the grade that may be compared to the Diploma Course in many of the Colleges of Agriculture in British India. It is a residential institution, and the bulk of the instruction, *i.e.*, agriculture both theory and practice, is in the Farm itself, while for instruction in the science—Physics and Chemistry, Botany and Biology and for Veterinary instruction the students were in the first few years brought over to the laboratories and the Veterinary Hospital in Bangalore. As the institution expanded, all the instruction was transferred to the Hebbal Farm itself where suitable buildings had been built. A Veterinary Hospital was also built on the Farm so that the school is now self-contained in all these respects. Provision for the imparting of instruction in Smithy, Carpentry and Fitter's work has also been made in the Farm Workshop. A dairy was also started with a small herd of local cows and buffaloes and the necessary dairy appliances such as separators, improved churns, etc., for practical instruction in cream separation, butter making and milk testing.

The school was intended to pay special attention to the theory and practice of agriculture proper, keeping the scientific instruction at a minimum in order to attract and train the sons of agriculturists who may eventually go back to farm their own land. A high entrance qualification was also for the same purpose not insisted upon. Instruction is free; a number of scholarships are awarded in addition. Instruction is given in all the branches of agriculture for each of which a separate staff is provided. The higher scientific staff of the Department also take part in the work of teaching.

Under this two years' course scheme, altogether 73 students passed out and were awarded certificates.

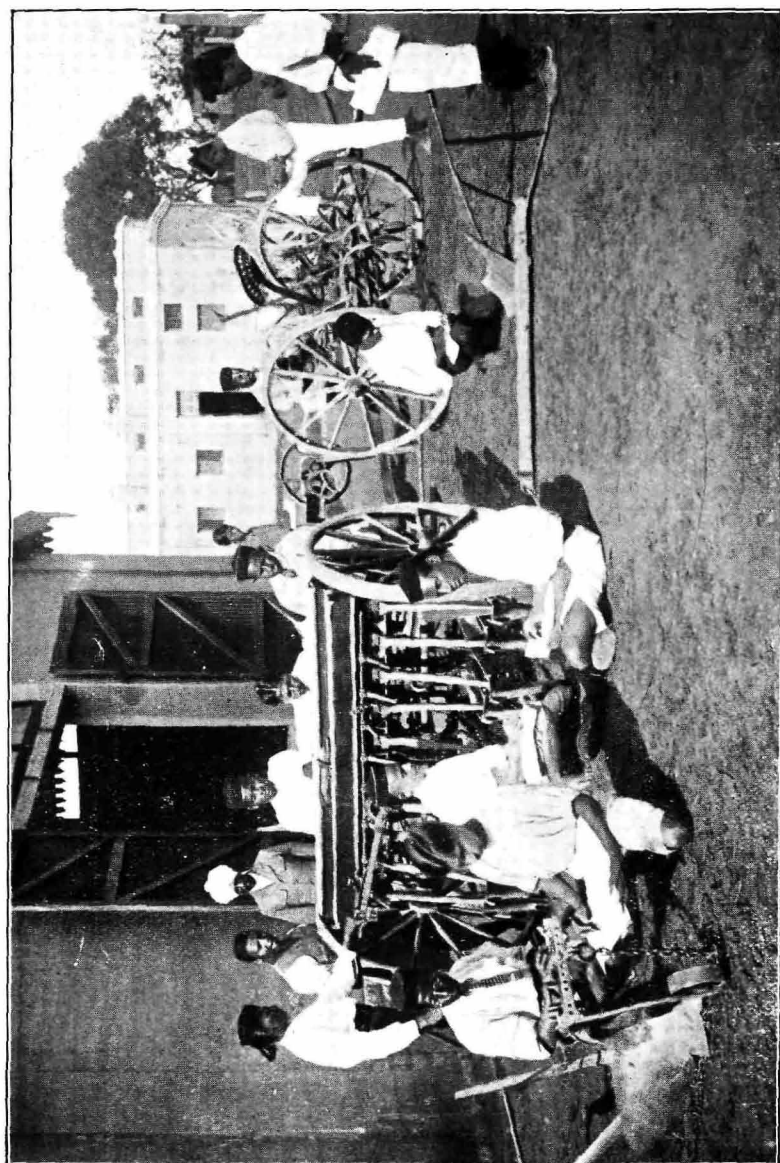
In the year 1920 the courses were revised and the school reorganised into one giving a three years' course.



At the same time the entrance qualification was also made of a higher standard. The instruction in the sciences was also, conformably to the scheme, made more detailed. The performance of all items of practical work on the Farm by the students has been insisted upon from the beginning in the practical classes and the varied work of the Farm affords very valuable training ground. Under the new scheme, 23 students have passed out and have been granted Diplomas.

Although the school has for its primary object the training of the rising generation of agriculturists to look to farming as a career and to attend to it with a knowledge of modern scientific agriculture and skill therein, the school has not been an exception, as far as the outlook of the students is concerned, to the schools and colleges of agriculture in other parts of the world which have set out with identical objects. A good number of men look to the Government Department of Agriculture for employment and probably the popularity of the school will be proportional to the prospects of employment under Government or other agencies. But though this is true of the Hebbal School quite as much as it is of such schools all the world over, it has still been possible to record that many among the passed men who possessed fairly large landed properties have refused to enter Government Service although they had very good chances of being taken into service. A few have had to go back to the land because Government appointment could not be had. All these men, scattered over the various parts of the State, continue to be valuable and serviceable allies to the Department, each in his neighbourhood. On the whole that at least about 25 men out of a total of 96 passed out should have taken to agriculture as a profession is not a record which need discourage us. The men who have joined the Department have nearly all of them justified themselves, being found intelligent and resourceful, energetic and tactful and fully entering into the spirit of the service required of them. No better testimony is needed to their qualities than the record of District Work given in the previous chapter.

(b) **Lower Grade.**—The Sri Krishnarajendra Vyavasaya Dharma Patasala or the Chikkanahalli Vernacular Agricultural School which gives a one year's course in agriculture is situated in the Chikkanahalli village, Tumkur District and was started in the year 1916. This institution



THE HEBAL AGRICULTURAL SCHOOL.—VIEW SHOWING STUDENTS STUDYING IMPLEMENTS,

owes its origin to the benefaction of one Mr. Ugre Gowda, a wealthy landholder and *sowcar* of that village. About six acres of dry land, a good irrigation well and some wet land, a fine spacious stone building for the school and hostel, and a cash endowment of Rs. 17,000 were all given by this charitable donor for the purpose of the agricultural school. This school is also residential and the students receive a scholarship from the endowment funds which are supplemented by Government. The instruction is both in the theory and practice of agriculture and for a one year's course, a great deal of ground is covered. The whole of the land being given over for students' work, practical instruction bulks large, students having to do all the work of the school farm including the tending of the bullocks, working the *kapile*, etc.

Practical instruction classes in carpentry and smithy, in rope and basket-making and in leather stitching are also arranged for. Government also pays for an excursion trip of the students to the larger farms of the Department. Veterinary instruction is imparted by the Veterinary Inspector of the Taluk.

During the last 10 years of the existence of the school, the total number of boys trained is 118 and of these 43 are in the employment of the Department as Fieldmen under the Agricultural Inspectors. The bulk of the remaining 75 have gone back to their land.

It may be added that the possession of land is insisted on in the case of every applicant to the school, so that we may have the assurance that admission to the school is not sought solely with a view to Government employment.

**Other Vernacular Agricultural Schools Proposed.**—It is the aim of the Government to increase the number of such vernacular agricultural schools, at least so as to have one attached to each of the Government Farms as a beginning. A school to be attached to the Nagenahalli Farm with a provision of Rs. 5,000 already granted by the District Board of Mysore will be opened in a few months; and other institutions may follow in the course of the next year.

(c) **Agricultural Education in Conjunction with the Educational Department.**—A scheme of "Rural Science" instruction was sanctioned by Government, for the imparting of instruction in agriculture, mostly of a practical nature, in certain selected Rural Middle Schools. The necessary land, irrigation well and indoor equipment were sanctioned

as well as an officer of the Agricultural Department, as itinerant instructor. Four schools were selected for the work, and the work was carried out for a couple of years. A batch of teachers of the Educational Department was also given a course of special training for this work on the Hebbal Farm. Before the scheme passed the experimental stage, the whole educational policy of the State was overhauled and this scheme was stopped pending the provision for a more satisfactory method of agricultural instruction in rural schools. In pursuance of this new scheme, agriculture, sericulture or horticulture (according to the local conditions) is made a compulsory subject of study in certain Lower Secondary Schools in rural areas, a separate teacher is to be appointed, and lands and other equipment for a small school farm where the students will do practical work also provided. The instruction will be a graduated course of three years. A special supervising officer is to be appointed to co-ordinate and guide the instruction. The scheme contemplates of course the full and active co-operation of the Agricultural with the Educational Department.

(d) **Short Courses.**—On the Hebbal and Marthur Farms, in the earlier years, a regular scheme of “Short Courses” was being organised and conducted. These courses were intended for those who desired to obtain instruction in specific subjects, mostly of a practical nature, and to suit their convenience, each course was made only of a week’s duration or less. The instruction was, of course, in the Vernacular. The courses were as far as possible held at the time of the year when the particular farm operations which were the subject of the courses were in progress. Thus in the ploughing season, the course was on tillage and tillage methods; in the jaggory boiling season, on sugarcane cultivation and jaggory boiling methods and so on. The Government met part of the travelling expenses of those who came to attend the course from long distances. Such courses were held by the Deputy Director at Hebbal, and by the Mycologist at Marthur. The number who passed through these short courses was about 300.

At the Chikkanahalli School, similar practical instruction classes are held at the appropriate seasons, generally on the weekly fair days.

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## CHAPTER VIII.

### Department of Sericulture.

#### EXTENT AND DISTRIBUTION OF THE INDUSTRY.

Mysore is admirably fitted by soil, climate and local conditions for silk production. The industry is at present practised over about a third of the area of the State, to the south of a line joining Chintamani, Sidlaghatta, Chikballapur, Kunigal, Mandya and Nanjangud, and is slowly spreading northwards. The sericulture of Kollegal Taluk (Madras Presidency) is a continuation and organic part of the Mysore system. There is practically no part of the State where climatic conditions do not admit of extension of the industry; the only limiting factor seems to be economic. The total area under mulberry is about 50,000 acres, the value of silk produced is over a crore of rupees, and the industry in its various branches supports about 200,000 families.

Mysore has a distinct race of silk-worm which is polivoltine, and spins a greenish cocoon yielding a beautifully lustrous silk of excellent natural quality. The Mysore worm is hardy and highly resistant to disease, but is slow in arriving at maturity and a poor producer of silk in proportion to the food consumed as compared with univoltine and bivoltine races. It is however one of the best polivoltine worms in existence.

#### POSITION OF SERICULTURE IN MYSORE INDUSTRIES.

Sericulture has an important place in the agricultural economy of the State. It employs that part of the labour of the home which is prevented by custom or feebleness from participating in the more strenuous work of the field, and also that part of the time of the raiyat which is left unfilled by the operation of the seasons. The utilisation of factors which would otherwise go to waste is wholly a gain, morally as well as materially, and one may claim for sericulture all that is claimed for spinning, with this addition, that it is more profitable, as it turns to account, certain differential advantages of climate and natural conditions.

## NATURE OF THE INDUSTRY.

The great bulk of Mysore sericulture is *subsidiary* to agriculture. It is practised by small agriculturists, who, as a rule do not employ paid labour, nor devote exclusively to rearing either time or house-room or other resources. They generally grow their own food, and depend on the returns from sericulture for clothing and condiments, and for the little extras which brighten their lives. But it must be mentioned that in parts of the State, sericulture has established itself as a *main* industry in successful competition with other occupations. This state of things is to be found in almost all the silk-producing parts of the State, in the vicinity of large markets, such as Channapatna, Chikballapur and Kollegal. In fact, in all important sericultural areas, there is a nucleus where sericulture is the principal industry. It may be noted that the same thing has occurred in Japan. This concentration seems to take place under the following conditions:—

(1) The soil is more suited for mulberry than for other crops;

(2) the population is much greater than the soil can support, if used for food crops, and there is in consequence necessity for a quick-yielding money crop which can remunerate intensive application of labour;

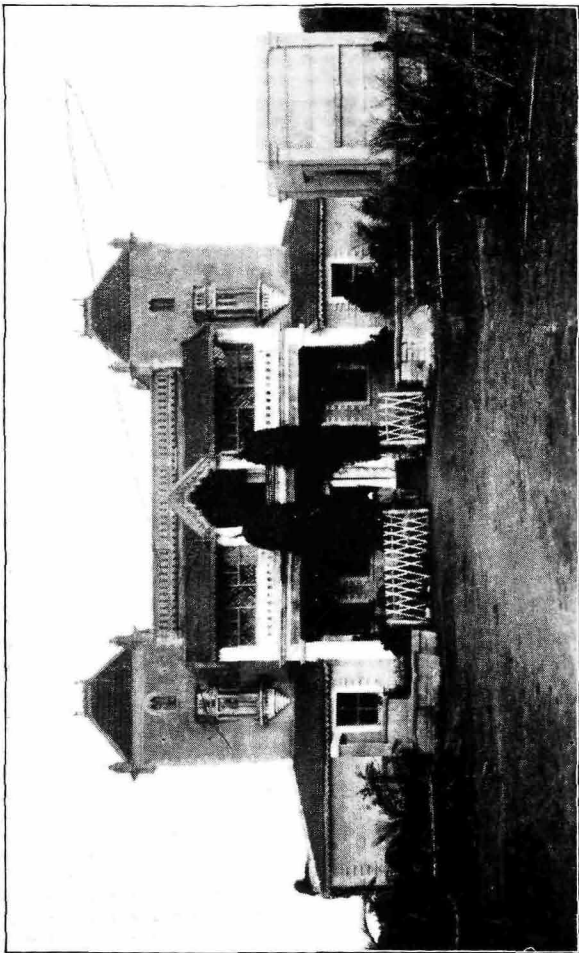
(3) vicinity of large towns or important weekly bazaars affords facility for selling silk and buying food-stuffs and clothing;

(4) there are no competing industries which draw off labour.

Sericulture practised as a main industry is rather more sensitive to external conditions than the normal form and is therefore the first to suffer from unfavourable variations. This is due to the fact that the competition of other crops with mulberry and of other occupations with the rearing of silk-worms is never absent, and makes itself felt when, for some reason, sericulture begins to weaken.

## AVERAGE RETURNS FROM INDIVIDUAL UNDERTAKINGS.

The Mysore rearer has, on the average, half an acre of mulberry, with which he rears six crops of silk-worms in the year. He loses or used to lose about two of these crops owing to bad seed or inadequate knowledge and resources, but is able notwithstanding to make a net gain



THE SREE KRISHNARAJENDRA VYAVASAYA DHARMA PATASALA :  
VERNACULAR AGRICULTURAL SCHOOL, CHIKKANAHALLI.

of about one hundred rupees a year. The average duration of a crop from start to finish is about six weeks. Apart from its undoubted material advantages, the industry necessitates a certain amount of co-operation and evokes a mental alertness which is more akin to industrial than agricultural pursuits. A sericultural village has generally an air of life and prosperity all its own.

#### HISTORY OF SERICULTURE IN MYSORE.

In spite of obvious advantages, the story of Mysore sericulture is one of vicissitude. In 1866 it had almost died out owing to disease or deterioration of silk-worms, and was temporarily restored by the importation of Japanese seed. The root causes of decay however remained untouched, and one or two bad seasons upset this lightly built restoration. But the vitality due to favourable natural conditions enabled the industry to start with a new lease of life about 1890. It is significant that in this revival the imported worm had disappeared, and the Mysore worm emerged triumphant. Once again the industry declined, till in 1914-15, it reached its lowest point, with an acreage, under mulberry of not much over 25,000. As a result of vigorous State action, the decline has been arrested, and the growth natural to a healthy industry has been restored during the past ten years.

#### STATE ACTION.

**Economic Conference, Agricultural Committee, Organisation of Sericultural Department.**—The efforts made to protect and develop sericulture are a measure of the growing recognition of its importance to the State. Not very long ago, the Education Department was entrusted with teaching sericulture through the agency of village schools—with no great success. The subject was then taken up by the Economic Conference, and a few trained men were sent out for work to sericultural taluks. Each step rendered the scope for advance more obvious. In 1913, Signor W. Mari, an Italian Expert, was appointed to organise sericulture, but was able to remain only for a year, during which time he started a small farm at Channapatna, and made a beginning in the manufacture and issue of cellular seed. After Signor Mari's departure, the work was continued and developed by the Agricultural Committee of the Economic Conference, which did much to



popularise disease-free seed and improve the methods of rearing. The causes of the decline of the industry were investigated and remedies proposed. The Committee's labours at this critical period in the history of sericulture proved that the situation was not hopeless, and indicated the lines of useful action. In 1916 Signor Mari's services were engaged for a second time, and Mr. N. Rama Rao, an officer of the Mysore Civil Service, who was Secretary of the Agricultural Committee, was associated with him for sericultural work. Signor Mari was only able to draw up a scheme before failing health and the outbreak of the Great War compelled him to return to Italy. Mr. Rama Rao was then appointed Superintendent of Sericulture in addition to his duties as Secretary of Agricultural Committee. In 1920 the work had developed sufficiently to necessitate the organisation of a Sericultural Department, and the transfer of the whole-time services of Mr. Rama Rao, Superintendent, the department being at the same time placed under the control of the Director of Agriculture. It secured and utilised to advantage, the services of Mr. M. Yonemura, a highly qualified Japanese Expert, for scientific work, and of Miss E. Sato for reeling. Later on it was possible to replace them by members of the departmental staff who returned from deputation with high technical training in Europe and Japan, or had been able to specialise by association with the Expert in scientific work.

#### *Classification of work in the Department.*

The activities of the Department have been based on a close analysis of the structure and requirements of the industry. Investigation placed it beyond doubt that the instability of Mysore sericulture in the past was due to one or more of the following causes:—

- (i) Bad or insufficient seed,
- (ii) Faulty methods of rearing and reeling,
- (iii) Bad methods of purchase and sale—resulting in “sweating” at each stage,
- (iv) Want of economic stamina.

That this analysis is in the main correct, seems borne out by the success of the action based upon it. The work of the Department falls under the following heads:—

Education.

Expansion.

Improvement of seed supply.

Demonstration and advice—help in case of silk-worm diseases.

Loans.

Formation of Co-operative Societies.

Establishment of filature and popularisation of Mysore silk.

Improvement of reeling—machinery, and methods.

Investigation of markets for silk.

### *Organisation of the Department.*

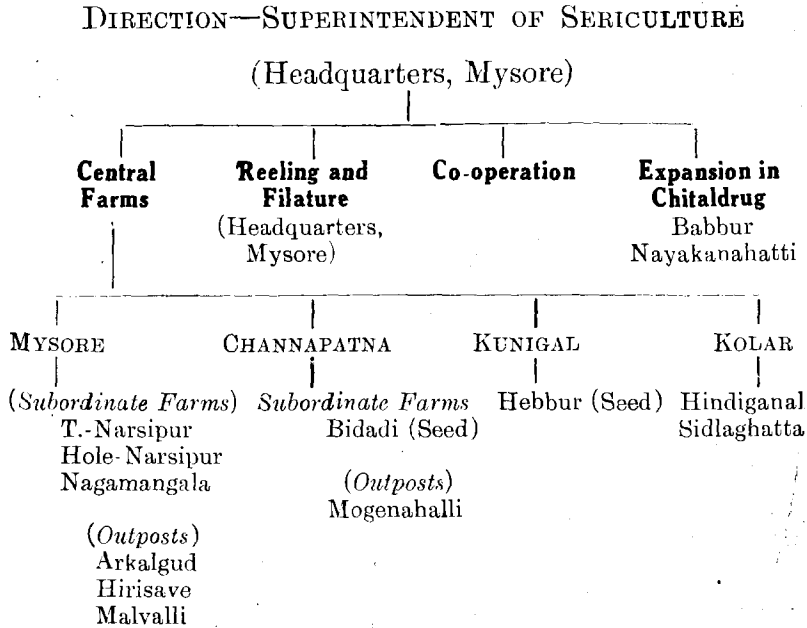
The organisation of the Department for working out these objects is as follows :—

**Circles, Farms, Outposts.**—The sericultural parts of the State are divided into four circles, each provided with a well-equipped Central Farm capable of attending to all the activities of the Department in the area allotted to it. These central farms are in the charge of officers called Senior Inspectors, most of whom have high academical and technical qualifications. Each central farm controls a number of subordinate farms, located at strategic points so as to command the sericultural area. There are altogether ten such subordinate farms. Their function is to keep in close touch with the raiyats to secure them their requirements in the way of mulberry cuttings, silk worm seed, rearing and reeling appliances, and loans, and to advise and guide them when necessary, to procure for them assistance, such as disinfection, etc., in case of silk-worm epidemics, and to render them generally all possible assistance in making the rearings a success.

In addition to the above, when work develops in a new area sufficiently to require continuous attention, outposts are established dependant on the nearest organised farm. These outposts are shifted from time to time according to requirement.

**Special Branches—Filature and Reeling, Co-operation, New areas.**—The improvement of reeling, and the filature constitute a separate Section under an officer entitled Superintendent of Reeling and Filature, with headquarters at Mysore; and the formation and care of Co-operative Societies is treated as a special branch of work, and has a Senior Inspector with headquarters at Channapatna to look after it. The expansion in Chitaldrug District is in charge of an Inspector, who at present works in direct subordination to the Superintendent.

The following statement shows the organisation of the Sericultural Department :—



The total staff, exclusive of clerical, is—

6 Senior Inspectors—4 permanent, 2 temporary.  
 20 Inspectors—18 permanent, 2 temporary.  
 30 Operatives { 1st class 10.  
                   2nd class 20.

The work done by the Department under the various heads of activity is summarised below :—

Education.	
Year.	Education.
1919-20 .	... 16 Long course students 6 Short course students 26 Panchamas
1920-21	... 4 Higher course 11 Lower course 24 Short course 33 Panchama students
1921-22	... 10 Long course (mostly volunteers) 20 Short course 11 Panchamas 26 Students in Taluk Schools
1922-23	... 8 Long course 14 Short course

1923-24	...	No regular course for want of funds. Yet 20 students in lower course and 3 in higher course were trained 1 from Hyderabad 2 from Coorg Farm School trained 10 people
1924-25	...	10 Higher course 10 Lower course. 5 Short course in Mysore. 4 Short course in Channapatna. 6 Short course in Hole-Narasipur.
1925-26	...	77 Students including 22 in reeling.

Till last year an allotment was usually sanctioned for scholarships in the Budget of the Department, and it was possible to train men for recruitment. The District Boards have always been very generous in giving stipends to students from their districts, and have evinced great interest in the encouragement of the industry. Students trained by District Boards have invariably settled down on their own lands. It is getting increasingly difficult to find recruits for the Department, for want of trained men, and owing to the very low rates of pay allowed to Operatives.

Every Farm of the Department is a school for practical instruction, and profoundly influences rearing methods in the neighbourhood.

In co-operation with the District Board of Mysore and the Education Department, Sericulture has been introduced as an examination subject in two selected Middle Schools at Kuderu and Malavalli. The District Board of Hassan has also sanctioned the opening of a Sericultural class on the same lines at a place to be selected shortly.

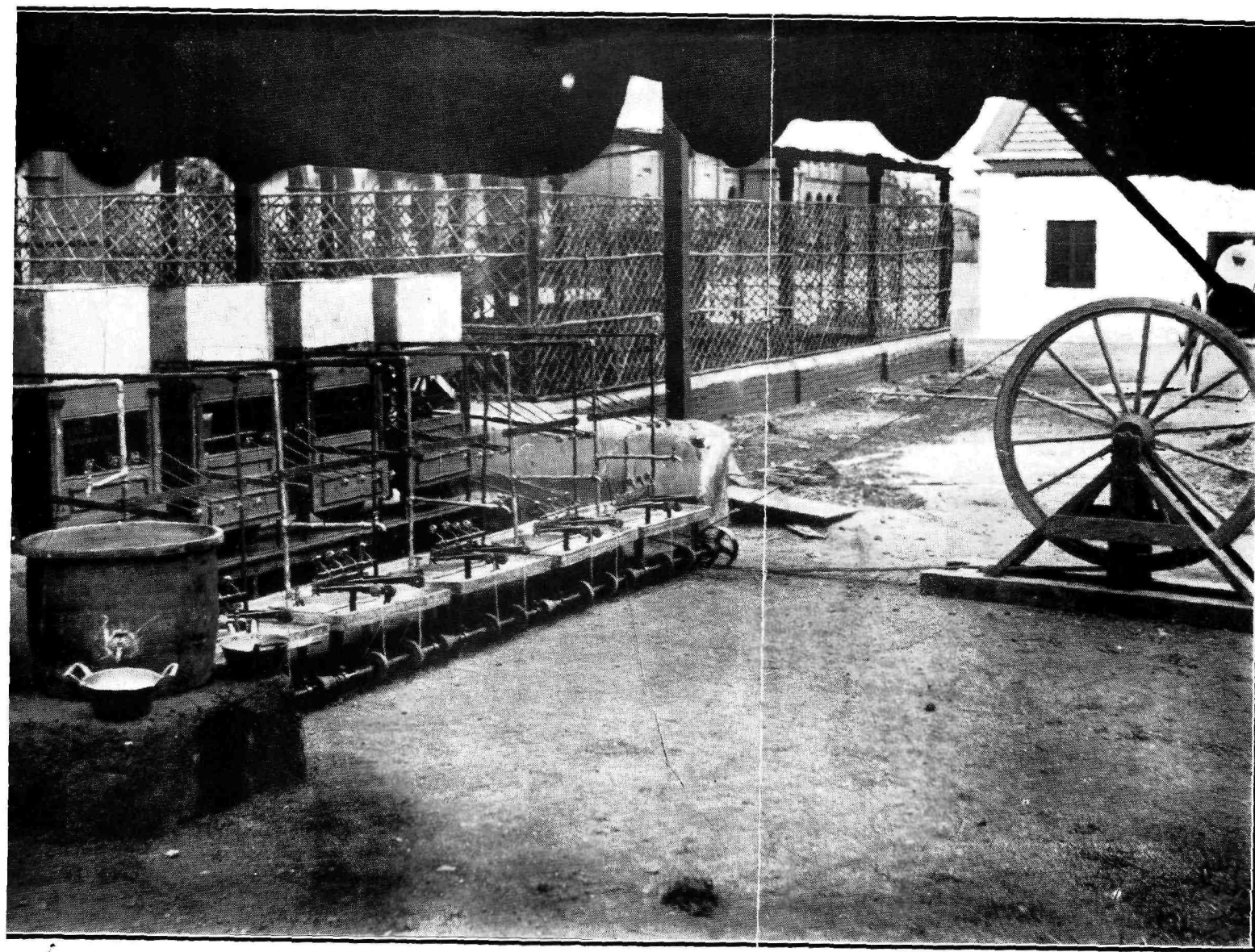
#### EXPANSION.

Exact statistics of mulberry cultivation are not available. Our ideas of fluctuations in area have to be based on the figures in the Season and Crop Reports, supplemented by direct information and verified by first hand general impressions. The export trade in silk furnishes an index of the state of the industry, and the demand for mulberry cuttings and for seed cocoons furnishes another indication. There is no doubt that the industry has been growing by expansion to the north of the old frontier, and that a corresponding strengthening has been going on in the old areas. The years

1923-24 and 1924-25 were bad years, owing to scanty rainfall and low prices, and in some places—specially where sericulture had become a main occupation—there was an immediate diminution in the area under mulberry. That the industry did not suffer more severely is due partly to its natural robustness, and partly to the slowness with which causes react on a conservative population. There is however no doubt that to-day, the industry has grown to nearly twice the size it was in 1914-15, and that deep-seated sources of danger have been eradicated. In estimating the scope for expansion, there is practically no part of the State where the climatic conditions are such as to preclude the industry; but regard must be had to the economic conditions favourable to its introduction. There are parts of the State where population is so sparse that agriculture and even domestic service are dependent on imported labour; introducing sericulture here is out of the question. There are other parts where wages are high owing to the existence of large centralised industries like mills, mining, factories, and work-shops; and others again where there are already suitable subsidiary industries, which it would be inexpedient to disturb. Large sections or communities have religious or sentimental objections to one or more stages of the industry; and this prejudice, where it exists, presents a fairly formidable barrier to expansion. Allowing for all this, there is no doubt that the sericulture of the State can be developed to about four times its present size, without interfering with any other avocation, but merely by utilising resources which now go to waste. The increased output could easily be absorbed by India, which at present imports about seven crores of rupees worth of silk and substitutes either as yarn or as fabrics. This forecast assumes, of course, that nothing will occur in the meantime to curtail the world's demand for natural silk, and that the distance between silk and rayon and other textiles will remain more or less what it is at present. This is by no means an improbable assumption. The relative position of natural silk and rayon will be referred to, again, later in the report.

#### SEED SUPPLY.

**Cellular Seed.**—The development of this section of work furnishes a measure of the growth of the Department in influence and usefulness. Ten years ago, the



MYSORE DOMESTIC BASIN.



rearers could, with difficulty, be persuaded to take 200 layings a year. In 1925-26, we produced 401,056 layings in our grainages, and procured, through our selected rearers, the production of nearly 70 lakhs of seed cocoons raised with cellular seed; and yet only a part of the demand was met. To produce this quantity of disease-free seed, the grainages strained their resources to the utmost; and it is probable that the limit with our existing equipment has been reached. The demand is so strong that if we quadrupled our production we could hardly satisfy it. A feature of the present demand is the eagerness of the raiyats for the new races. These new races and hybrids, which are a result of our experimental and breeding work, represent an increase in yield of nearly 40 per cent and a curtailment of the period of rearing by 4 to 5 days in its most expensive part. To produce seed of these races on an adequate scale, it is necessary to have cold storage plant, with which the Department has yet to be provided.

Some idea of the value of this branch of the Department's work can be formed when it is said that whereas formerly 2 crops used to be lost out of every 5 owing to bad seed, failures from that cause are now comparatively infrequent in areas reached by our seed organisation.

**Selected Seed Rearers.**—A word of explanation is necessary about selected seed rearers. Since cellular seed is expensive, and its supply is very limited, it is necessary to supplement the work of grainages—which turn out only cellular seed—by a carefully planned and controlled campaign of seed production with the co-operation of selected rearers in the recognised seed centres. The basis of selection is a good mulberry garden, a disinfestable rearing room, and skill and reputation on the part of the rearer. The selected seed-man has to bind himself to rear only cellular layings issued to him from the Government grainages, and to submit to supervision and control. He gets the cellular seed free of cost, his rearing room is disinfested, and he is placed in touch with the great body of rearers requiring seed cocoons. We have now 47 seed rearers in the far-famed seed centres of Bidadi, Kunigal, and Hebbur, capable of producing in the aggregate about 70 lakhs of seed cocoons. Mention must be made of a very notable piece of intensive seed work conducted last year at Mugur, one of the largest silk-worm rearing villages in



the State. Three consecutive crops had failed owing to pebrine. The Department organised a systematic disinfection of rearing houses, and supplied cellular layings to all rearers. *Not a single crop failed.*

The following figures show the growth of the seed work of the Department.

1919-20	... 180,297	D.F. layings distributed to raiyats.
1920-21	... 277,862	D.F. layings were issued.
1921-22	... 326,193	D.F. layings and 27 lakhs of seed cocoons through Seed Cocoon Campaign.
1922-23	... 395,959	D.F. layings and 60 lakhs of seed cocoons.
1923-24	... 240,901	D.F. layings and 90 lakhs of seed cocoons and 9,000 D.F. layings of New Races. (Very unfavourable season.)
1924-25	... 390,168	D.F. layings (including 12,000 of New Races) and 70 lakhs of seed cocoons.
1925-26	... 401,056	D.F. layings and 68 lakhs of seed cocoons.

#### DEMONSTRATIONS, IMPROVEMENT IN REARING, TREATMENT OF SILK-WORM EPIDEMICS.

What with the improvement of the seed supply and what with the example and the educative influence of the farms, the Mysore raiyat, especially in the vicinity of the departmental institutions, now gets a yield which represents a substantial improvement over what he used to get in the past. Ten years ago 25 to 30 lbs. was considered a fair yield for a rearing with 100 layings; the present average is somewhere about 40 lbs. The record yield got anywhere was 89 lbs. for 100 layings of a  $F_1$  hybrid near Channapatna. The improvement consists in better spacing, a more suitable adaptation of food to stage of development, more efficient methods of cleaning, some attention to silk-worm hygiene, and greater care in mounting and harvesting. A very large number of demonstrations accompanied with lantern lectures are held every year at important jattras, festivals, or other large gatherings of people with the help of District Boards. Competitions are arranged between improved machinery and the old-time village appliances, and many a convert to rational sericulture has been secured. There were two large Sericultural Conferences at Channapatna and Mysore held by the District Boards of Bangalore and Mysore,

respectively, where a number of important resolutions were passed which are now under consideration. The District Board of Mysore, the premier silk-producing district of the State, co-operated very cordially with the department by giving sericulture a prominent place in all their Conferences and extending to it a very generous measure of encouragement and assistance.

### LOANS.

As has already been stated, the small rearer has not much economic stamina, and is frequently in need of loans for short terms. He was formerly at the mercy of small money-lenders who practically squeezed him dry; and when, as frequently happened, the money-lender was also a buyer of cocoons, the rearer rapidly lost freedom of sale, and fell into a position of dependence. There are two obvious remedies—State aid through *takavi* loans, and the organisation of co-operative credit. Real co-operation suited to the industry is of slow growth, and as will be stated later, a sound and promising beginning has been made. Government have sanctioned a scheme of sericultural loans also; in practice, these loans at present provide for long term credit for capital expenditure, while short term loans are as a rule left to co-operative and private credit. Formerly the administration of these loans was entrusted concurrently to local revenue officers and the Superintendent of Sericulture; the revised rules of 1925 vest this responsibility solely in the Sericultural Department. The following statement sets forth the amount of loans granted each year:—

Year.	No. of loans.	Amount. Rs.
1916-17 ...	27	3,060
1917-18 ...	11	920
1918-19 ...	3	450
1919-20 ...	4	950
1920-21 ...	21	4,880
1921-22 } 1922-23 } 1923-24 }	Information not available. Loans were granted under old rules by Revenue	
1924-25 ..	10	2,830
1925-26 ...	39	7,450

### CO-OPERATION.

There is no doubt that sericulture offers an almost ideal field for co-operation, and yet strangely enough, till

last year, there was not in existence a single Sericulture cooperative society. One had been started by the Co-operative Department some years ago at Sidlaghatta, but it failed. It was obvious that existing types of society would not do, and that the industry required a distinctive type, combining short-term credit with supply of seed and appliances, technical guidance, and aid in marketing. The work of such a society is sericulture first, and co-operation afterwards; and close and constant technical direction is essential. A type of society suited to Mysore sericulture was worked out. Government approved of the scheme, and sanctioned a special Senior Inspector for working it. They placed a sum of Rs. 2,800 with the Registrar of Co-operative Societies for being advanced to sericultural societies. *Ten* societies were formed during the year in the following villages, which were prepared for the development by careful propaganda:—

- |                   |                   |
|-------------------|-------------------|
| (1) Mangalwarpet, | (6) Sidlaghatta,  |
| (2) Malurpatna,   | (7) Thimmasandra, |
| (3) Chakkere,     | (8) Kudlur,       |
| (4) Mogenhalli,   | (9) Mugur,        |
| (5) Closepet,     | (10) Karohatti.   |

Most of these societies have started very well, and show great willingness and aptitude, but have more than justified the anticipation that close and constant technical guidance is vital, at least in the initial stages.

#### FILATURE, VILLAGE AND DOMESTIC REELING.

A small filature of 12 basins of the French type was installed in Mysore in 1922. The object was to train labour, experiment in reeling technique, test the reeling quality of cocoons, and familiarise the silk world with Mysore sericulture. This filature started with exporting silk to France and England, and is now devoting itself to the manufacture of high grade silk capable of utilisation in Indian weaving. It is slowly educating the Indian demand, and preparing the way for grading up the quality of Mysore silk as a whole. It would be very useful if the filature were supplemented by a small throwing mill and a weaving establishment. The filature is capable of producing about 300 lbs. of silk a month.

A filature, equipped also with a throwing plant, has been established by private enterprise at Bangalore.

**Village and Domestic Reeling.**—Filatures have undoubtedly an important part to play in raising the industry by giving a lead in the improvement of reeling, and by preparing the way for superior silk by advertisement and securing a demand; yet the country's silk as a whole can only be benefited by gradually improving the equipment and methods of the village reelers.

Last year experiments were conducted with various types of domestic basin; demonstrations were organised on a large scale, and constructive criticism was invited from all eligible quarters. The result of the investigation may be summarised as below:—

(1) It is essential to the development of Mysore sericulture and even to its stability, that the quality of the raw silk produced should be improved and made uniform, so as to extend the scope of its employment in manufactures. At present, its low quality confines it to a narrow and comparatively unremunerative market.

(2) Conditions in Mysore make it imperative that this improvement must commence in the villages in close touch with the rearing industry; and it cannot be imposed from outside by the establishment of filatures. The improvement of raw silk is dependent on the improvement of cocoons by the provision of good seed and employment of better rearing methods on the one hand, and the introduction of more efficient reeling machinery on the other. In Mysore, reeling cannot, without disaster, be dissociated from seed production and rearing.

(3) The reeling machinery should satisfy the following conditions:—

(a) It must possess all the essential working parts of the latest type of filature basin, which ensure proper size, strength and cohesion.

(b) It must be strong, simple in construction and capable of being attended to by the village smith with his ordinary resources.

(c) Its initial cost must be within the means of the average village family; its working should demand no special skill or expense, and it should exact no requirements in the way of furniture.

(d) It should be portable, and should lend itself to gradual expansion by the addition of fresh units, securing fresh economies with each expansion.

(e) While not inferior in efficiency to the best foreign basin, it should compare favourably with the

village *charka* in cheapness of operation and adaptability to rural conditions.

**Mysore Domestic Basin.**—It is obvious that (b), (c), (d) and (e) put the foreign basins out of court at once. To satisfy these conditions, a basin was designed and patented under the name of the "Mysore Domestic Basin." This basin can be worked either singly, or in combinations consisting of two or more. Probably, five form the most advantageous combination, as they can be operated by a single turner. They have been successfully tested throughout the State, and have invariably elicited great interest and enthusiasm during demonstrations. Silk reeled with the domestic basin is nearly as good as filature silk, and fetches prices fully 30 per cent higher than silk produced with the village *charka*.

#### EXPERIMENTS.

Important experiments in silk-worm breeding are being conducted in the Central Farms at Mysore and Channapatna, covering practically the whole field of sericulture. In breeding, the main objects kept in view have been—

- (1) selective improvement of the Mysore race of silk-worms,
- (2) fixation of new races,
- (3) determination of the extent to which hybrid seed could be profitably issued for producing reeling cocoons,
- (4) rearing and acclimatisation of pure races for stock in the preparation of hybrid seed.

Besides the progress made towards the objective, the experiments were fruitful in results of great scientific interest. The experiments were only made possible by a free and successful employment—for the first time in India—of the artificial treatment of hibernating eggs so as to make them hatch like multivoltines.

The experimental breeding work disclosed some important facts. The limits of improvement by selection in the pure Mysore race itself are in sight: it is not possible to shorten the rearing period, or to secure a more profitable ratio between the yield of silk and the consumption of mulberry leaves. The experimental work has been rich in results of great value to the industry, but to take full advantage of them, it is necessary to have

more grainage and rearing space, more staff, and facilities for controlling temperature. The rearers are anxious to rear the improved seed and seed of higher yielding races, but the department is not at present equipped to meet the demand.

#### ORGANISATION.

Sericulture has its roots in the economic life of the country, and is necessary to its progress and happiness. Improvement of seed and technical methods would be barren of result without an organisation that secures to the workers the full benefits of their labour. No industry can prosper without a power of adaptation to changing conditions and without the capacity to assimilate new ideas. Its progress depends on the readiness with which it can benefit by the advance of knowledge, and this requires alertness and power of internal adjustment, or in other words, a broad-based organisation which can keep abreast of technical progress, and which can safeguard the industry by influencing production, and by securing an appropriate place in markets. The organisation must begin in the village, with a co-operative society or panchayet; the co-operative societies, panchayet and leading sericulturists of a taluk may form a Taluk Association, and the process of federation may rise through taluk and district, till it culminates in a Central Silk Association for the State, capable of representing the industry and looking after its interests. Steps are being taken, with the approval of Government to form a Provincial Silk Association, which will probably have ramifications extending into taluks. It is necessary also to have a Conditioning House in the State.

#### SUMMARY OF PAST WORK.

The chief measures for which the department has been responsible are :—

- (1) Organisation of Government grainages.
- (2) Organisation of aided grainages.
- (3) System of selected rearers of seed cocoons.
- (4) Organisation of supply of mulberry cuttings to aid expansion.
- (5) Organisation of practical instruction to new rearers and reelers.
- (6) Provision of sericultural loans.

- (7) Concessions for introducing sericulture in new areas and among the depressed classes.
- (8) Establishment of filature.
- (9) Designing new types of basin for Mysore conditions.
- (10) Establishing new races and breeds of silk-worm.
- (11) Organisation of co-operative societies.
- (12) Securing co-operation and assistance from Local Boards.
- (13) Investigation of South Indian markets.
- (14) Concessions for the formation of mulberry *topes*.
- (15) Introduction of sericultural instruction in two middle schools, in co-operation with the Education Department.

#### PROGRAMME OF WORK FOR THE FUTURE.

The programme of work for the future will not only have to maintain progress on the lines already established but will have to provide for the following important developments :—

- (1) Establishment of cold storage plant in the Central Farms.
- (2) Investigation of the requirements of Indian silk manufacturers and adaptation of Mysore raw silk thereto.
- (3) Organisation of trade, and the establishment of suitable centres of distribution.
- (4) Standardisation of Mysore silk and establishment of a Conditioning House.
- (5) Formation of local silk associations which are in quick touch with all branches of the industry and their affiliation to a Central Provincial Silk Association.
- (6) Development of sericultural co-operation so as to embrace every part of the industry.
- (7) Legislative control of seed production and of epidemic diseases.
- (8) Protection for Mysore silk.

This work has been and is being done in Japan, and is equally necessary here. The work requires more staff and more equipment and is of a magnitude to tax the energies of the department for the next twenty years. Later on, it may be possible to transfer some of the functions to local bodies retaining only scientific work and control in the Department.

## CONCLUSION.

There is evidence of an essential change in the outlook of the Mysore silk industry. Till quite recently, we were in secure possession of the South Indian market which took our average saleable output, however coarse, provided only it was cheap. The combination of cheapness and badness held our industry in thrall, but kept it alive. Now things are changing. Better reeled foreign silks, and artificial silk and with its cheap glitter irresistible to the untutored eye have invaded the traditional markets, and are fiercely competing with Mysore silk. One usually reads in foreign journals that artificial silk—or rayon as it is called—can never displace natural silk, and so on; and this is no doubt true, but with two important provisos—*viz.*, (1) the natural silk must be a high grade article, like what is imported into Europe and America, (2) the consumers must possess sufficient enlightenment to know what they are buying, and to know both what artificial silk is and what it is not. In India where much of the natural silk is reeled in a low grade, and where a large proportion of the consumers look upon rayon as a durable foreign silk possessing the advantage of cheapness, rayon *does displace, and is displacing* real silk. In the long run, a better knowledge of rayon may confine its employment within just bounds: but it is possible that this knowledge may come too late to save Mysore sericulture from irremediable injury. There is evidence that in Mysore, the very home of silk, a large proportion of the looms which formerly employed only real silk, now take rayon, and the rayon fabrics are penetrating into middle class homes. Usually, bad seasons, by contracting the output of silk, raise its prices, but last year the industry suffered from the double evil of bad season and low prices. There seems to be no doubt that one of the causes of this abnormality is the increasing vogue of rayon. One has only to know that the imports of rayon into India have increased from 19·4 lakhs of rupees in value in 1922 to 204·35 lakhs of rupees in 1925 to realise the magnitude of this menace to our silk industry. The world's production of rayon in this period has grown from 79·3 million pounds to 185·5 million pounds; and much of the accumulated capital and disciplined skill of some of the most progressive countries



in the world are being devoted to increase, improve and cheapen this product. With proper direction and improvement the natural silk industry ought to rise above the plane of direct conflict with this giant organisation by producing a high class fibre which supplies a distinctive demand which will not accept a substitute; but in a cottage industry practised by the raiyat classes, adjustment to new conditions is a very slow process indeed, and in the meanwhile the industry itself may suffer lasting harm. Experience shows that our raiyats are very tenacious of sericulture so long as any hope is left; but once they are driven from it, nothing will induce them to take it up again. In fact, the places where sericulture once existed but exists no more, seem blighted with a curse against revival. The reason is, that each acre which goes out of mulberry is a loss in capital alone of over a hundred rupees, and the wrench in economic life resulting from the loss of an established occupation paralyses the spirit of enterprise. And this is a loss which falls on a specially poor and hardworking class of people.

There can be no doubt that our silk needs protection against foreign silk and more specially against rayon. This is not the place for discussion of the subject; it may suffice to say that the Board of Agriculture recorded it as their considered opinion that:—

“In view of the growing menace to the silk industry from the competition of foreign silk and silk goods on the one side, and of artificial silk and artificial silk goods on the other, it is essential that strong measures should be taken for the protection of the industry.”

Apart from this, it is equally essential that Mysore should produce cocoons at less cost by employing better seed and improved methods, produce better silk by employing more efficient and up-to-date machinery, and standardise production by adapting it carefully to markets. All this is necessary not only for improvement but for survival. A Silk Association with ramifications reaching out into taluks and centres of production, and a State Conditioning House seem absolutely essential to safety.

## CHAPTER IX.

### **The Civil Veterinary Department.**

The beginning towards the formation of the Civil Veterinary Department for the State was made in 1905 when Mr. N. Narasimhiengar, Veterinary Officer, attached to the Imperial Service Regiment, was appointed Inspector of Cattle Diseases in Mysore, under the official control of Dr. Srinivasa Rao, the then Director of Public Health.

In December 1906, Government sanctioned the opening of a Veterinary Hospital at Bangalore, on the recommendation of the Revenue Commissioner, and placed the Inspector of Cattle Diseases in charge of it under the control of the Revenue Commissioner.

A scheme for the organisation of the Civil Veterinary Department was sanctioned on 4th September 1907 in which provision was made for the appointment of two Superintendents, five Veterinary Inspectors and thirty four Assistant Veterinary Inspectors, to be introduced gradually as experience was gained and as funds permitted. As a first instalment, 3 Hospitals and 4 Dispensaries were ordered to be opened during 1907-08 with an Assistant Veterinary Inspector in charge of each of them, an additional Assistant Inspector being also appointed for the Bangalore Hospital to enable the Inspector of Cattle Diseases to tour out more freely.

The designation of the 'Inspector of Cattle Diseases' was changed to 'Superintendent of the Civil Veterinary Department' from 1st July 1911.

The development of the Department was very slow, and even at the end of 1914, the strength of the Veterinary Department (excluding clerical, subordinate and menial establishments) consisted of 1 Superintendent, 8 Assistant Veterinary Inspectors for the 8 Veterinary Institutions and two extra temporary Assistant Veterinary Inspectors.

Owing to the great demand from all the Districts for the opening of more dispensaries, four new dispensaries were opened each year for three years commencing from 1916-17. For four years thereafter there was no progress in this direction and 3 institutions were opened in 1922-23, four in 1924-25 and five in 1925-26 and thus we have

to-day 32 Veterinary Institutions spread all over the State. Proposals for opening four more dispensaries during the year 1926-27 have been submitted to Government for sanction.

**Re-organization of the Department.**—As occasion demanded the Department was re-organised and the strength of the Establishment according to the last re-organisation of the Department in 1921 excluding clerical, subordinate and menial staff is as under :—

A Superintendent  
Two Assistant Superintendents  
Two Veterinary Officers  
Forty Veterinary Inspectors

A scheme for the further re-organisation of the Department is under the consideration of the Government.

**Direction.**—The Department was under the control of the Revenue Commissioner till September 1920, when it was transferred to the control of the Director of Agriculture in Mysore.

**Recruitment.**—The Officers of the Department are recruited from persons holding diplomas from any of the recognized Veterinary Colleges in India. As the Veterinary College at Lahore is training students on the same lines as in the Colleges in England, scholarships of the value of Rs. 40 per mensem are given to those prepared to study there and at present there are thirteen scholars studying there in different classes. Recommendation for sending eight more students this year is pending approval of Government.

**Mobile Corps.**—In 1915, Government sanctioned a Mobile Corps. In February 1918 orders were passed increasing the number of these Inspectors to eight who would be deputed for work, according to necessity, in any part of the State, under the orders of the Superintendent.

**Campaign against Contagious Diseases.**—The most common diseases prevailing in the State are rinderpest, black-quarter, anthrax, haemorrhagic Septicimia and foot and mouth diseases. Preventive inoculations against several of these diseases have proved very successful and the people having realised the necessity and usefulness of it, it has been found impossible to cope with the demand for inoculations, due to the paucity of hands in times of outbreaks of these diseases.

The *Serum alone* method of inoculation against rinderpest was being adopted all these years but seeing that the immunity conferred by this method was only for a very short period of nine days, '*serum simultaneous*' method was started very vigorously during the year 1925-26 and, but for the introduction of a levy of fee by Government at Re. 1 per head of animal inoculated by this method which the raiyats could not in many instances afford to pay, very substantial work could have been achieved; as it is, 40,000 animals were protected by this method during the last year. A virus producing station has been opened and steps are being taken to prepare anti-rinderpest serum also locally, in order to meet the large demand, comparatively at a cheaper rate.

An Anthrax Vaccine which is said to confer permanent immunity was also indented for from the Biological Institute of Australia and the results of treatment therewith will be watched with interest.

**Treatment of Cattle.**—Treatment of cattle in the State is free. But at the Veterinary Hospitals at Bangalore and Mysore, a fee of annas four for a horse and one anna for a dog per day is charged for treatment and a consolidated fee of Rs. 10 for castrating a horse and Rs. 5 for a pony is charged exclusive of feeding and grooming which the owner of the animal has to arrange for.

**Castrations.**—In order to prevent deterioration and to improve the breed of cattle, vigorous steps are being taken to have all deformed and stunted bulls castrated by an improved method, in addition to placing good breeding bulls in several Veterinary Institutions and sending them from village to village for service.

**Lectures and Demonstrations.**—Advantage is taken by the Department of the numerous cattle-shows, Taluk Conferences and other public gatherings to deliver lectures to the people on suppression of contagious diseases, improvement of live stock and other matters pertaining to the Department and on the necessity and advantages of resorting to Veterinary Institutions in time of need and of reporting of outbreaks of cattle diseases at their onset.

Even when there are no outbreaks of any epidemic disease, Veterinary Inspectors in charge of Hospitals and Dispensaries go out on a systematic tour for 10 to 15 days in a month, on propagandist work, visiting village after village in their respective jurisdictions and giving any professional aid that may be necessary.

Leaflets in Canarese, are prepared by the Veterinary Inspectors on cattle diseases, cattle breeding and rearing, the preservation and economy of fodder, and are distributed freely among cattle owners during their itineration. They carry a medicine chest containing the more common medicines and instruments for treating sick animals on tour.

**Programme of work for the future. —**

- (1) Investigation of all animal diseases and extension of prophylactic inoculative treatment in general.
- (2) Pushing on the work of 'serum simultaneous' method of inoculation against rinderpest.
- (3) Preparation of Anti-rinderpest serum locally.
- (4) Protection of animals against anthrax with the vaccine received from the Biological Institute of Australia to confer permanent immunity.
- (5) Increasing the number of Veterinary Institutions in order to give quicker relief to cattle owners in time of need.
- (6) Deputation of Veterinary Inspectors for post-graduate training.

In order to give an idea of the nature and extent of work carried out by the Department every year, the following statement relating to the year 1925-26 is appended.

Serial No.	Particulars	Number
1	Number of fresh cases admitted to the Institutions ...	56,115
2	Total of daily attendance for the year ...	1,26,909
3	Number of castrations performed in the Institutions...	2,578
4	Do of other operations performed in the Institutions ...	4,109
5	Number of cases treated on tour ...	14,362
6	Do castrations performed on tour ...	17,126
7	Do other operations performed on tour ...	797
8	Do outbreaks of rinderpest registered ...	1,646
9	Do outbreaks of rinderpest attended to ...	1,369
10	Do outbreaks of Anthrax registered ...	1,941
11	Do outbreaks of Anthrax attended personally...	262
12	Do outbreaks of H. S. registered ...	413
13	Do outbreaks of H. S. attended personally ...	92
14	Do outbreaks of black-quarter registered ...	1,211
15	Do outbreaks of black-quarter attended ...	896
16	Do outbreaks of all other contagious diseases registered .. ..	2,226
17	Do of outbreaks of all other contagious diseases attended personally .. ..	682

Serial No.	Particulars	Number
18	Number of inoculations performed against rinderpest by { S. S. Method	39,912
	{ S. A. Method	66,630
19	Do inoculations performed against Anthrax ...	3,898
20	Do inoculations performed against Haem Sept.	1,617
21	Do inoculations performed against Black-quarter .. ..	24,556
22	Do vaccination against sheep-pox ...	1,030
23	Do cattle fairs held .. ..	80
24	Do cattle fairs attended by the Veterinary Inspectors ... ..	78
25	Do Taluk Conferences held .. ..	73
26	Do Taluk Conferences attended ... ..	68

## CHAPTER X.

**Live Stock and Amrut Mahal Department.**

This was organised as a branch of the Department of Agriculture in January 1920, when Mr. Davison, B. S. A. was appointed Live Stock Expert.

**Dairy Cattle.**—There are two herds at present being handled from the dairy point of view ; a small herd comprising of the strength of about 35, and of several breeds of cattle headed by a *Hallikar* bull. This is meant chiefly to serve its function in connection with instructional work in the Agricultural School at Hebbal. By discarding a number of animals, a uniform type has now been obtained which conforms to that of the *Hallikar* breed. Owing to limitations of space, it has not been enlarged. The existing stock, whether of good draught type or of the ordinary non-descript variety, is inefficient as a milch animal, and with such low yielding material on both sides, an improvement in milk yield is not aimed at. The policy here is to retain local cattle and effect what improvement is possible by selection and line breeding. Good bull calves that would make useful animals for raiyats desirous of obtaining good young bulls for future breeding are sold.

The other herd, a larger one, which is at Rayanakere and is the property of His Highness the Maharaja, is, with his kind permission administered by the Agricultural Department. This herd at present consists of over two hundred animals of which 80 are milking stock ; the latter again consist of Sind cows, *Hallikars* (or the Mysore indigenous breed), Ayrshire-Sind half-breds and Holstein half-breds.

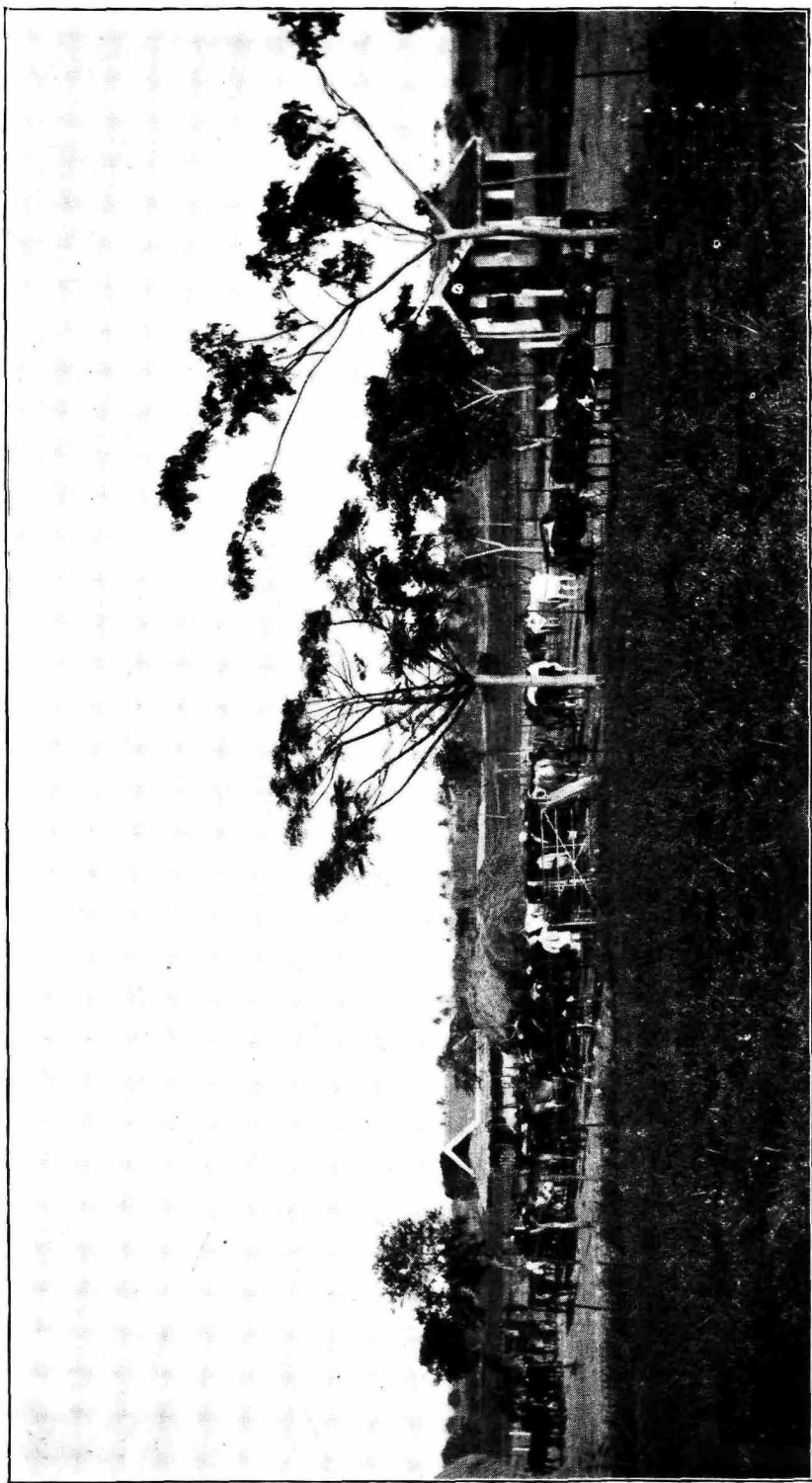
From results so far recorded it is found that for ordinary commercial dairying these half-breds are by far the most productive and again those bred from pure Holstein bulls and good Sindi cows gave the best results.

The following is the daily average milk yield of the three principal breeds :—

			lbs.
Holstein Sindi	....	....	25·4
„ Hallikar	....	....	11·6
„ Ayrshire	...	....	17·1







H. H. THE MAHARAJA'S DAIRY FARM AT RAYANKERE,—VIEW SHOWING THE DAIRY HERD.

In the main our breeding operations have two primary objects:—

(1) To maintain a pure Sindi herd for breeding with pure imported Holstein bulls.

(2) To produce sufficient half-bred animals for keeping up the strength and efficiency of the herd.

The second phase in the breeding operations, *i.e.*, to put these half-bred cows to pure Holstein bulls producing three-fourth bred animals has to be borne in mind but nothing on any extensive scale can be done until we have experienced whether the three-fourth bred animals now in the herd prove strong enough to be retained.

The half-bred Hallikars, as already said, have not given the high percentage in milk given by the Sindi half-breds but it is too early to form final conclusions and more definite information will be available as the young stock of this breed comes into bearing.

The disposal of the young males as draught animals is a question that cannot be ignored and there is no doubt that the young Hallikar half-breds are keenly sought after while Sindis are scarcely wanted.

On this account and for the reason that the Hallikar as the indigenous Mysore breed is of considerable local importance, further work is being carried out.

There are several mixed breeds with Ayrshire and Jersey blood combined with Holsteins, etc. These will have to be gradually eliminated from the herd so as to prevent confusion in the breeding.

Correct breeding and pedigree records of the herd are maintained and it will be of great advantage if a register of the various pedigree herds is maintained for all India.

The fodder crops grown in the Farm consist chiefly of jola and sunflower which is made into 700 to 800 tons of ensilage. Besides this 400 tons of green grass is fed. For sometime experiments in feeding have been carried out by the Agricultural Chemist at the Farm partly in conjunction with Mr. F. J. Warth of the Bangalore Imperial Institute for Animal Husbandry. Owing to epidemic they were, however, interrupted.

Though buildings for the accommodation of the full herd are provided it has been found of greater advantage to keep the animals in the out-of-door runs both day and night.

AGRI.

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**Draught Cattle.**—As a means of awakening an interest in the improvement of draught cattle, maintenance of breeding bulls in some of the Veterinary Institutions and Agricultural Farms for public service was adopted in the year 1922 and some of these are sent out on a definite itinerary to enlarge the territory of demonstration. The actual progress made by this system is not easy to measure and can only be gauged by the number of services given and by any tendency there may be towards an increased demand for good breeding bulls by private owners. With regard to stationery bulls it was found that a large percentage of cows covered were the property of the townspeople. Coverings such as these therefore could not be regarded as furthering the production of better cattle nor of any propagandistic value among the raiyats.

The touring system, which was intended more for the purpose of arousing an interest in the matter of maintaining good sires in villages than to make any appreciable effect on the stock of the country, could not work quite satisfactorily as the bulls had often to be withdrawn from the villages on account of fodder difficulties, prevalence of contagious diseases and other causes. In the year 1925-26, these bulls were therefore sent out to selected villages and allowed to wander at large in village herds from which all the scrubs were castrated. It is anticipated that there would be quite a good number of calves in these villages and their superiority compared to the village cattle would create an appreciable effect in the minds of raiyats as regards the importance of a good sire.

With a view to overcoming the tendency of the raiyats to sell their breeding bulls at the first good offer and to encourage the steady maintenance of useful bulls, both for private purposes and for the benefit of the public, subventions are granted to those who comply with the regulations governing them.

**Sheep Husbandry.**—A small cross bred Merino flock that was established at Gottigere near Bangalore by the Agricultural Committee was taken over by this section and the sheep were transferred to the newly opened sheep farm at Yellachihalli, Mysore District. A flock was also maintained at Hebbal and seven Merino rams were imported from Australia. For sometime these did not breed and as a result, the breeding operations were hampered; besides, four of these rams succumbed to a disease

which manifested itself during the hot weather. Some investigation work was carried on in the Public Health Institute, but the disease could not be identified. The lambs born to the Merino local cross are considerably larger than the local sheep when adult and the wool clip has shown considerable increase over the local sheep.

The yield of wool from yearling Merino hybrids is from 2 lbs. to 3 lbs. and is of fair quality as against 6 to 17 ounces of coarse wool from the adult local ewes. The Cawnpore Mills have favourably commented upon this wool, the best sample of which was quoted at 14 annas per lb. A few white ewes and two half-bred rams were supplied to three applicants as foundation stock for breeding purposes, and demonstrations of improved method of clipping and dipping were undertaken. The demand for extension of this work in the Kolar District was such that a Sheep Breeders' Association was organised in January 1923, with a membership of 70. A total number of 150 ewes of good stamp, some of which were bred to Merino rams, and several half-bred rams were distributed to the members during this year. The demand in course of time very much exceeded the supply, and the situation was in no way relieved during the following year. The effect of spear grass which comprised all the grazing in Yellachihalli was almost unbelievable. The spears were found to pierce not only the skin but also the lungs and intestines of a number of sheep, specially half-breds on account of their denser fleece and many deaths were directly attributable to these effects. A brush harrow was worked over the land when the grass was ripe and very little good was effected thereby. Some "Natal grass" seeds were sown in competition with the spear grass, also with similar result. As the Merino rams would not live for more than a year, six Merino rams and six Merino ewes were imported in 1924 with a view to breed pure Merino rams which may be more easily raised and be more amenable to the climatic conditions than those imported as adults. All the six ewes dropped lambs, but all of them died within a year. The year 1924 was a year of drought and covering operations were delayed on account of delay in the growth of grass, and the sheep being in poor condition. Some difficulty was also experienced in getting the Merino rams at first. The death rate on the farnis was high due largely to parasites and low conditions. On account of the above

reasons, district work in sheep breeding could not progress to the extent it should have done, were conditions normal. But demonstrations of improved methods of clipping and dipping operations were carried out in a large number of villages and the membership of the Kolar Sheep Breeders' Association was increased. Some of the cross bred rams were sold to the members and others to raiyats in other districts where pastoral conditions were normal. Propaganda work done in the district has taken the form of machine clipping, and encouraging, annual instead of semi-annual clipping, dipping every six months, and the formation of pure white flocks instead of motely flocks usually maintained and the distribution of cross bred rams. All these lines of work have been well received and it is only the lack of staff and other facilities which has prevented its spread to a generous extent. All the white sheep of members, who are using cross bred rams are registered in an Association flock book with a view to the further registration of all acceptable progeny. Wool is collected from the members, graded and sold through the Association. A sheep show is also held in this district every year and prizes awarded for the different kinds of wool yarn and fabrics prepared out of half-bred and other wools. A ram flock is established at the District Headquarters to avoid the inconvenience and delay incidental to the transportation of stock from the farms. It has just been possible only last year to carry on the cross to the F<sub>2</sub> generation, and the breeding operations are carried on at Babboor, Chitaldrug District. The double help may turn out to be of real stability in its influence in effecting an improvement on the local flocks.

The average yields of wool are :—

Merino rams	...	..	11½ lbs.
Country ewes	...	...	12 oz.
One-fourth bred ewes	..	...	1¼ lbs.
Half-bred ewes	...	...	1¾ lbs.

Half-bred lambs have shown a birth weight of 5 to 6 lbs., which is practically double that of the pure country lamb, and growth has been considerably faster than in the case of the country animal. The adult weight of a half-bred ewe is 60 lbs. as against 35 to 40 in a country ewe.

**Amrut Mahal Department.**—This Department, formed a separate Government Department under the control of

the State Military Authorities. The cattle were originally used as a source of transport bullocks for Military purposes, supplies being made to the British as well as to the State Troops. The decreased requirements for this purpose and changed views with regard to the necessity for assisting in the improvement of livestock resulted in the transfer of this Department from the Military to the Agricultural Department in the year 1923. The present strength of the herds which are kept in a semi-wild state is 6,000 divided into 15 herds and with about 6 to 9 grazing grounds or kavals being allotted to each according to the strength of the kaval and quantity of pasturage they afford. As the strength of the herds was reduced a few years ago, an area of nearly 25,000 acres was surrendered to the Revenue Department in 1921. The number of present hot and cold weather kavals is 178, comprising an area of 223,212 acres. Of these some are covered with thick jungle and do not afford much pasturage. Stud registers are maintained and cattle are branded with the year of their birth and a serial number.

Although Government Orders permitted the sale of breeding bulls from these herds to agriculturists of the State at a concession rate of Rs. 75 each, half of which was to be borne by the Local District Board, in former years, very few would go in for them as the confinement and very severe handling which is necessary to bring these animals under control seriously impaired their vigour. As the breed has been developed originally from the better class of indigenous stock, and is admirably suited to combine with the bulk of the cattle of the State a proposal to sell them to breeders at a fair upset price is under the consideration of Government.

Male calves one and a half year old are made available according to the requirements of agriculturists, cattle breeders and others at fixed upset prices throughout the year. Old and defective cows are sold in lots of ten or more, with their calves-in-milk, under nine months old, at upset prices.

*Bona fide* cattle breeders are allowed to purchase one breeding bull for every twenty cows purchased, at a concession rate of Rs. 100 for a three year old animal.

The surplus cattle are annually disposed of in auction sales held at different centres.

The present Amrut Mahal herd cannot be said to be as pure as it was some years ago, and a careful selection

and uniformity of treatment is indicated to erase a good many points of difference.

These cattle are however poor milkers and as dairy cattle seem to be inadequate to cater to the demands of cities and towns ; and any substantial improvements in their milking qualities by careful methods of breeding can be a matter of only slow development.

## CHAPTER XI.

**Agricultural Co-operation.**

The Mysore Co-operative Societies Regulation was first introduced in 1905 and it was amended in 1918, and in the whole State there were 1,603 societies working at the end of June 1926. Of these, 1,278 societies belong to the Agricultural class who form nearly 80 per cent of the population. They had a total membership of 49,743 and collected a total Working Capital of Rs. 27,39,414. Credit forms the backbone of the movement and the societies for promoting objects other than credit form a small minority, being only 105. The reasons for this small progress in the development of non-credit agricultural co-operation are not for to seek. It is much easier among the rural people, who are for the most part backward and illiterate, to start societies for credit than for production and distribution, which involve much technical skill, knowledge, experience, etc.

As in the British Indian Provinces, non-credit work is combined with credit in many of the societies. The members being the same even if different societies are organized in rural parts, it is found to be of greater advantage to combine several functions in one and the same society, maintaining different accounts for different branches. Especially in villages, advantages are immense in combining credit and non-credit work in one and the same institution on account of the limited sphere in every respect and the difficulty of finding suitable workers of diverse kinds. A beginning is made in respect of supply of agricultural requirements, such as, good seeds, ploughs, manures, sugar-cane mills and pans, etc., to the raiyats, and there are over 200 rural credit societies now doing this kind of non-credit work, besides the regular non-credit agricultural societies.

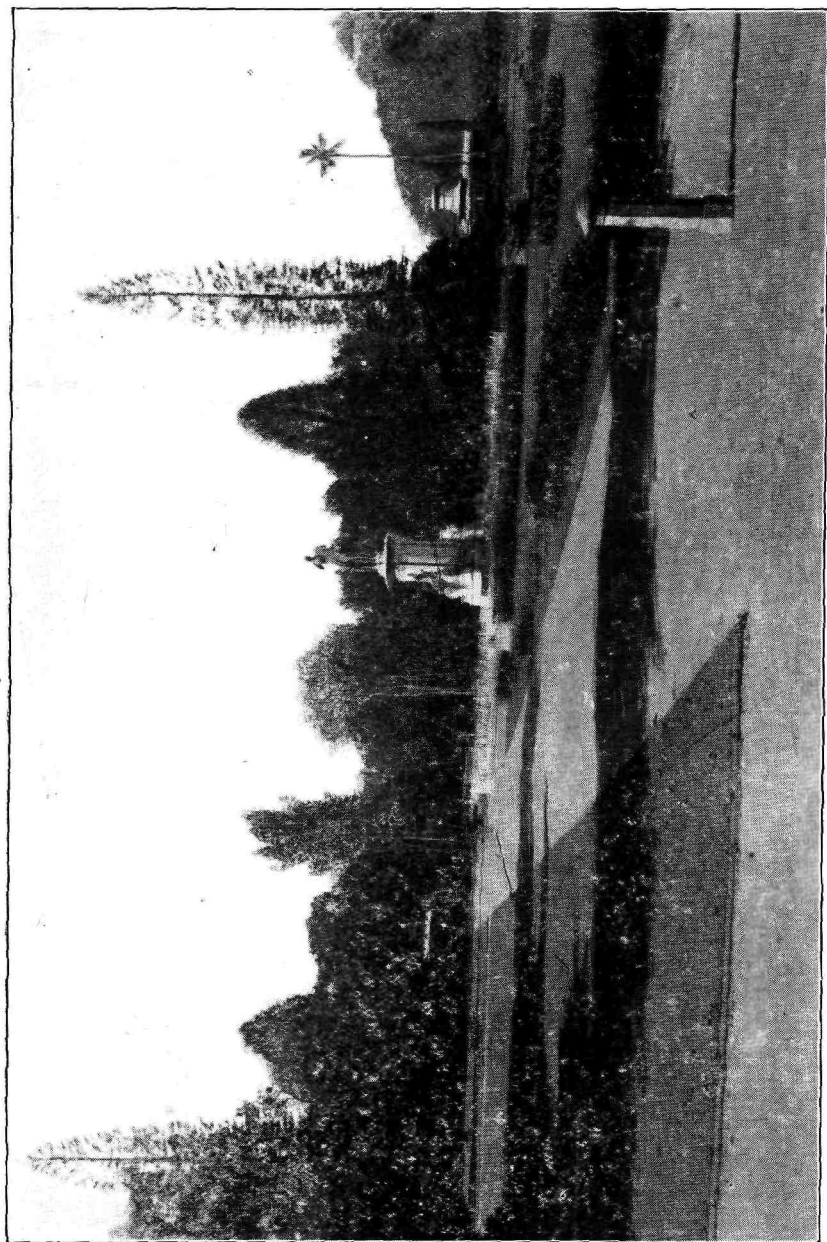
The special advantages accruing to the agriculturists from these supply societies are numerous. The aim of both the Agricultural and Co-operative Departments is identical, being essentially economic in their activities. The chief requirements of a raiyat, besides cheap credit, are good seeds, implements, manure, etc. The Agricultural Department has carried on various experiments and found



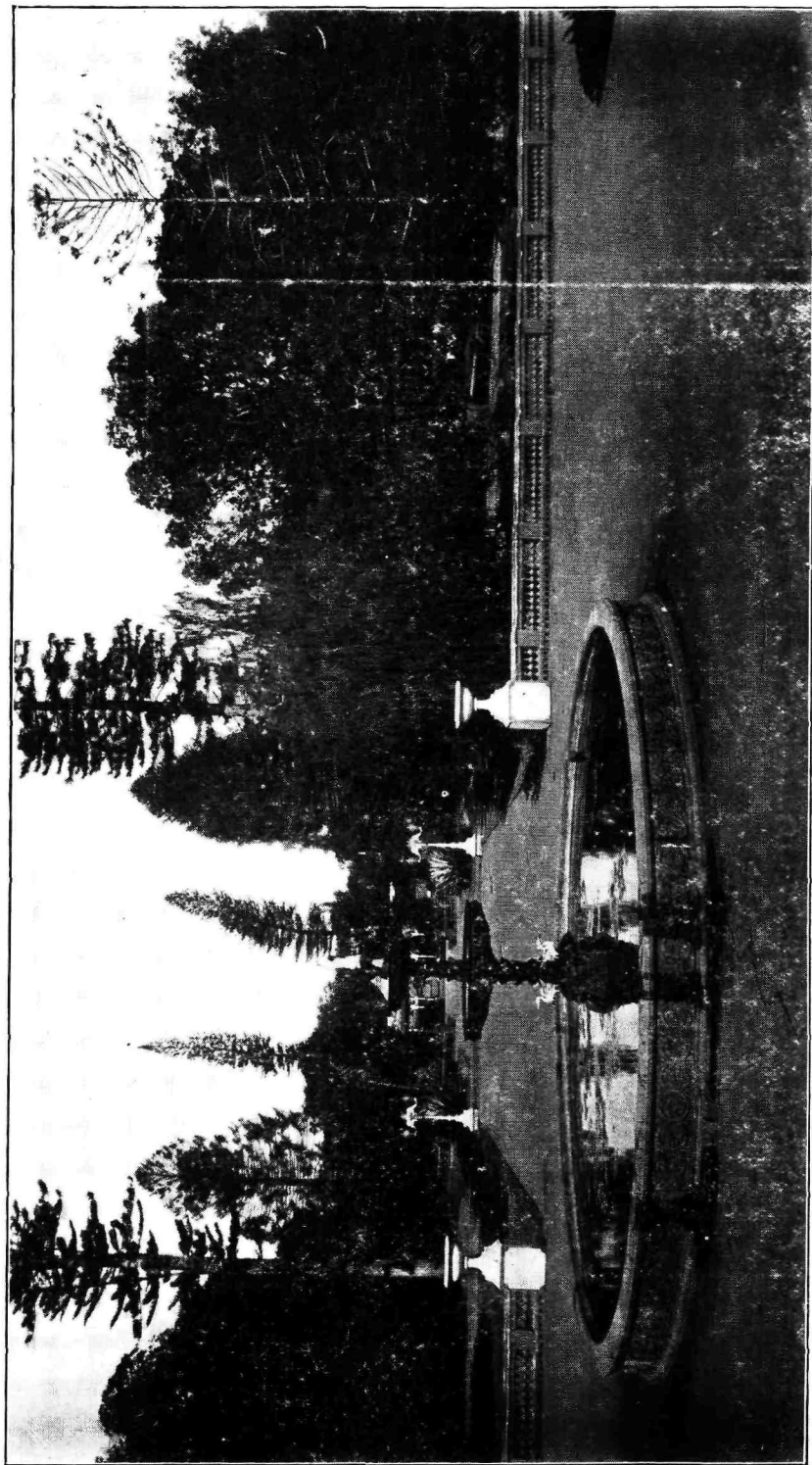
the best kinds of ragi, paddy, sugar-cane, potato, and cotton seeds which are most suitable for the Mysore soil and its climate, and has been doing demonstration work on a very extensive scale to popularize their use. The Department has also improved and manufactured a plough best fitted for all kinds of soils in the State. The difficulty in obtaining reliable seeds at the right time is overcome to a large extent. Unless the people make use of the help of the Specialists of the Agricultural Department for their requirements and take advantage of their advice and help they will find it difficult to adjust their business to the changing conditions of rainfall, price, etc. The raiyats are too conservative to change their methods and habits of work all at once. They obtain seeds for sowing from the grain dealers without caring for the quality, because it is the only supply to which they are used and which is readily available. They have now begun to feel that the Co-operative Societies are intended for providing facile credit to them and appreciate their help in time of their need. In order to bring about a change in their methods and popularise the good results of Agricultural Department, Rural Credit Societies have been gradually coming forward to undertake the supply of seeds, ploughs, manure, etc., recommended by the Department as being most useful and profitable to the raiyats, and make them readily available to their members at the proper seasons.

Another advantage is the free supervision and advice that the departmental officers would give to the raiyats that obtain their requirements through the Department. For stocking these articles, funds are largely necessary. In accordance with a circular issued by the Department several societies have been setting apart a portion of their Reserve Fund for the purpose. The Apex Bank at Bangalore is ever ready to afford help to the societies in this respect. Besides, the Government were also pleased to sanction Rs. 8,000 at Rs. 1,000 per district for this important economic benefit of the people. As additional demands are coming in from the societies, a recommendation has again been made to Government for sanctioning at least Rs. 10,000 this year again for the same purpose.

Next in importance in non-credit agricultural co-operation, are sale societies, *i.e.*, societies for the sale of produce grown by the members in profitable markets. The aim of these is primarily to get rid of the middle men who



VIEW OF THE LAL-BAGH—THE STATUE GARDEN.



VIEW OF THE LAL-BAGH—THE TERRACE GARDEN.

are responsible for the low price obtained by the producers in the sale of their produce. Large differences between the bazaar rates and the rates realized actually by the producers are apparent, and the figure usually high, as near as 50 to 60 per cent. The difficulties are aggravated often when the cultivator is in debt to the middleman, and is forced to sell his articles through him at prices dictated by him. Human nature being what it is the middleman naturally fixes a low price for the produce, as he takes the risk of waiting for a chance to sell it to his own advantage, and thus the cultivator gets very much less than what is rightly due to him.

The above difficulty can be overcome by the organization of Co-operative Societies for the sale of agricultural produce. Such societies can collect the produce of the members and sell it at the best prices, in the open market, instead of through middlemen. For doing all this work, honest and energetic workers well acquainted with the conditions of trade variations and market fluctuations are necessary. In all villages, it is not easy to get such efficient men as workers. For the present, the existing credit societies having the best of men among their directorate can undertake to help the members in this respect, though first attempts prove uphill work for want of sufficient experience. A small beginning has been made in the Sagar Taluk for areca growers and their work is yet in an experimental stage.

There appears to be large scope for the formation of a Co-operative Society for the sale of *copra* at Tiptur, and of cardamoms at Saklespur; one for cotton growers at Harihar has just been formed, and it is hoped that its business would soon develop under the technical advice readily afforded by the Agricultural Department.

Regarding the formation of Co-operative Grain Banks the Special Committee on co-operation have laid emphasis on the real difficulties in the way of their working and they have opined that in any case it is important that they should only be formed in places where there is real need and a fair prospect of their success exists.

The Association of co-operation with agricultural improvements may assume different forms. In one place the society may perform the functions of an Agricultural Association, in another, Agricultural Associations may have a separate existence but may work in union with the co-operative movement. It may safely be said that, by the

united efforts of the Agricultural and Co-operative Departments, the Agricultural Department devoting its sole attention to experiments and demonstration and the Co-operative Department undertaking the entire Agricultural Depot work, *viz.*, the sale of implements, seed and manure, the economic uplift of the people is bound to take place in the near future.

## CHAPTER XII.

**Horticultural Department.**

The sphere of activities of this Department as it now stands extends over General and Economic Horticulture besides Botanical work.

The development of the Department on its present lines dates from 1908 when Mr. Krumbiegel assumed the office of the Head of the Department. and the following paragraphs deal with it under the various sections :—

**General Horticulture.***Government Botanic Gardens.*

**Garden Improvements.**—In 1908 a new nursery consisting of a germinating shed, propagating frame, indoor plant pandal, outdoor nursery beds, bulb store and potting yard was opened.

The fernery, orchid house and foliage house were improved and enlarged. The following sections were newly laid out :—Economic Garden, Rose Garden, Bulb Garden, Succulent Border, Pot Garden, Statue Garden and Japanese Garden. A portion of private land to the south-western corner was acquired and a new gate was opened leading to the Basavangudi Extension. Also some land near the main gates was acquired and two gate lodges were built. A workshop and an implement depot were also built. The old Darwinia was converted into a restaurant and a new building for offices was put up close to the nursery. The glass house, its surroundings and road leading to it from the main gates, the office and other buildings were provided with electric lights. The water-supply was improved by the installation of an electric motor pump and by the construction of two large reservoirs near Kempegowda's Mantap on the Rocky Hill in Lal-Bagh. The tank water is pumped to the reservoirs from where it comes down to the garden by gravity. The old fashioned open cement drains were removed and iron pipes introduced in their place.

**Cubbon Park.**—(Bangalore). The Cubbon Park has been greatly enlarged and remodelled, consisting of

a nursery, King and Queen statues garden, Sir Seshadri Iyer statue garden and bandstand garden. The general landscape effect was greatly improved by planting shrubberies and ornamental trees. The lawns were edged with bricks. New garden seats were put in various parts of the garden. New roads and footpaths were opened. The Sillebade village was acquired and a large area of land was added to the park. A number of playgrounds and a golf-course were made.

**Parks and Gardens in Mysore.**—The lay-out of the two main parks, the Curzon Park and the Gordon Park have been greatly improved and architectural features added. There are a number of gardens connected with Government buildings. All these have been maintained in good condition and improved vastly.

**Daria Dowleth Bagh, Seringapatam.**—Daria Dowleth Bagh which is the garden round Seringapatam, the Summer Palace of Tippu Sultan, and which was originally laid out in Moghal style was also much improved. The plant house was reconstructed this year.

The charge of the garden round Gumbuz with the tomb of Hyder and Tippu and their close relatives was handed over to this Department two years ago. The fruit and ornamental gardens are being improved there.

Under recent Government Orders all the gardens around Government buildings have been taken to this Department. According to this, 46 new gardens have been added to the existing charges. In 1908 there were 11 independent charges; in 1925 there were 28 and now these have increased to 70.

### Scientific Work.

The centre of this section of work is the Botanic Gardens.

The Seed Depot was started in 1908 with the object of importing new plants and seeds from other Botanical Institutions in exchange for seeds and plants collected here. This is also the centre from which improved varieties of seeds and plants are distributed to the public. Seeds and plants are also sold here. Technical advice on horticultural matters is freely given not only to those in the State but in many cases to enquirers outside the State.

The Bureau of Economic Botany was started in 1911. Reference slips and typed extracts of various economic plants and horticultural crops are taken from the various journals received here and filed in the ledger cabinet boxes. We are dealing with about 200 subjects arranged in alphabetical order. Information is filed in three separate divisions in each cabinet, *viz.*, (1) Cultural, (2) Botanical and (3) Commercial. Similarly a case has also been prepared for plant diseases and there are 44 subjects in this case. This arrangement was started here for the first time in India.

The Herbarium originally contained a collection of about 1,000 specimens and recently it has been very much improved by the addition of specimens collected in the garden and elsewhere locally and also specimens received from other Botanical Institutions as donations. The present number of specimens is 3,500. The herbarium work is now carried on up-to-date methods.

A carpological collection has been recently opened.

Technical information on various subjects has been collected and noted in registers. These contain notes on flowering and fruiting periods of creepers, shrubs and trees. The General Book consists of names of plants grouped together in the garden. The Pot Garden Register contains information on the seasonal flowers so that a continual show may be had in the garden. A statement of seasons for sowing seeds has been made.

The Collection of Botanical Drawings consists of 1,384 excellent coloured sheets mostly of local plants, flowers, fruits and plant diseases. There are also a number of photographs of economic plants grown here.

The Library is very much enlarged during recent years by the addition of standard works on Botany, Horticulture and other allied subjects. There are 396 books and 460 volumes of journals. Most of the journals are received in exchange for departmental reports and publications while some are subscribed for.

A Seed Testing Room was opened in 1912. Germination tests are carried out on tiles specially made for the purpose.

The Fumigatorium was built as early as in 1912. All the incoming and outgoing plants are fumigated with hydrocyanic acid gas. This was the first of its kind in India. The Imperial Entomologist visited it and introduced it in all sea-ports where the Pest Act came into force.



**Insectory.**—The local horticultural pests are reared and their life histories studied. Insects are collected in various stages and pinned in Museum Boxes. Good deal of work has been done in finding out the life histories of important pests affecting fruits and vegetables and remedial and preventive measures worked out.

### **The Mysore Horticultural Society.**

This society was started in 1912 and continued to work till 1914, when the Great War broke out. It was revived in 1919. The total membership is now 130. There are three classes of membership, Fellows paying a subscription of Rs. 18, Members paying Rs. 12 and Associates paying Rs. 6 per annum.

The following are the privileges enjoyed by the members:—

1. Free supply of plants and seeds to the full amount of their subscription.
2. The use of the Lal-Bagh Library.
3. Sending seeds and plants for trial at the Lal-Bagh nursery.
4. Assistance of the Society in procuring special indents of seeds or plants from abroad.
5. Free supply of Society's publications.
6. Free admission into the Half-yearly Horticultural Shows.

The Society is managed by a Council consisting of a Chairman, a Treasurer, a Secretary and twelve members.

**The Chief Activities of the Society are.**—(1) The holding of Half-yearly Horticultural and Poultry Shows, (2) Holding of Annual Garden Competitions, (3) Helping the members of the Society in horticultural matters in all possible ways.

### **Fruit Cultivation.**

A Fruit Survey of the State was conducted in the year 1914-15 at the request of the Agricultural Committee of the Mysore Economic Conference and a detailed report was published. It is seen from this report that only  $2\frac{1}{2}$  annas worth of fruits is consumed per head per annum. Fruits worth over  $1\frac{1}{2}$  lakhs of rupees are imported every year over and above what is grown in the State. The following

observations about the local fruit cultivation are made:—

- (1) Area under cultivation is very small and knowledge of varieties and kinds is lacking,
- (2) cultural methods are primitive,
- (3) water supply is insufficient,
- (4) large plantations are few and neglected,
- (5) marketing facilities are wanting and
- (6) fruit preserving is not understood.

The measures suggested for improving the Fruit Industry in the State are:—

- (1) Opening of an Experimental Orchard and a Fruit Nursery,
- (2) opening of an Horticultural School,
- (3) appointment of District Horticultural Inspectors
- (4) starting cold storage godowns,
- (5) granting of *Takavi* loans,
- (6) the Institution of an Arbor day, and
- (7) The starting of School Gardens.

In 1912 the Agricultural Committee sanctioned the Horticultural School, training in practical and theoretical Horticulture, Botany, Entomology, Mycology and Engineering was given and the course extended to over three years. Four batches consisting of 42 students were trained. Most of the students were absorbed in the Palace and Government services. Some were employed by private agencies outside the State. In 1919 the school was closed when the Economic Conference was abolished. Thanks to the present administration, funds are provided this year for the revival of the School.

The District Staff was sanctioned in 1917 and one Inspector for each District was appointed. They did good work in inducing the raiyats to open Fruit Plantations and also helped in opening school gardens, laying out parks and avenues, but unfortunately this staff again was abolished in 1921.

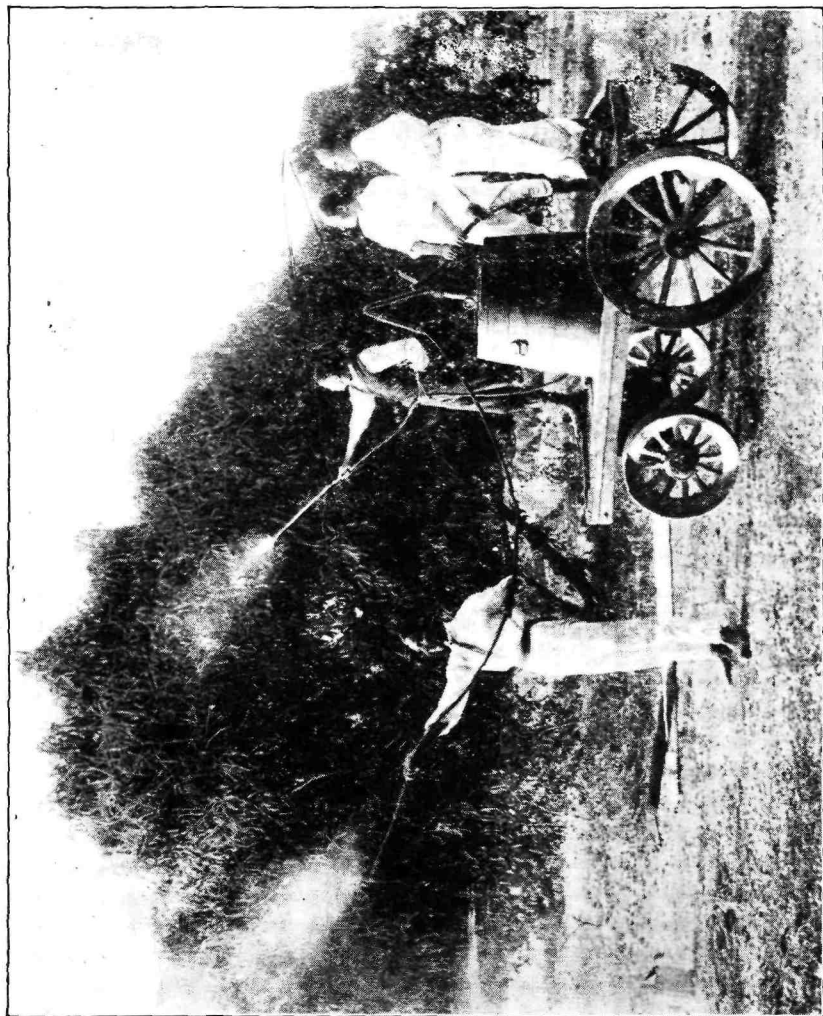
During the Fruit Survey it was found that the fruit plantations were infected with green bug (*Lecanium viridi*). With the help of a small temporary staff the infected gardens were repeatedly sprayed and the disease was brought under control. In 1921 a full-time Inspector was sanctioned and appointed and intensive spraying work was taken up for other diseases.

Important research work has been done in some plant pests. Chief among them are the "Citrus Borer" (*Chelidonium cinctum*); this insect was responsible for a

large amount of damage to orange and lime plantations all over the State and also in Coorg. Its full life-history and wild host plants were completely studied for the first time in India in the year 1922-23 and simple preventive and remedial measures were found out. Successful remedies suitable for tropical climate were found out for American blight of apples, grape vine mildew, aphids, white ants, etc. During the last five years, 52,725 trees in 725 gardens, mostly in this District, have been treated. The raiyats are now realising the importance of spraying for fruits and last year we had several orders for sprayers and chemicals and they were promptly imported and supplied.

Owing to financial stringency, Government had not sanctioned an experimental orchard and nursery till this year. However, with the limited facilities available at the Lal-Bagh and the Palace Gardens, work on trials of some important tropical and temperate fruits were taken up and already some very good results have been achieved. Chief among them are the following:—

**Apples.**—The temperate climate, the elevation, sweet-water supply and a long dry period in the fruiting season at Bangalore help in the formation of sugar in fruits and the apples produced in Bangalore District are of excellent quality. A net income of over 1,000 rupees is obtained from an acre under apples. Therefore attention was first paid to improve this important industry. A survey of this fruit was made in 1921 to see whether there is any progress in the cultivation. It disclosed the glaring fact that within the period of seven years about 50 per cent of them are diseased. The Spraying Staff immediately visited all the gardens and demonstrated preventive and remedial measures against this pest. And now since last year the disease is completely eradicated. Old records show that this disease has been a serious impediment since 1890. It is proposed to introduce the Pest Act to prevent introduction of this pest again into the State. About thirty varieties of apples were imported from Australia and tried here; out of them one variety "Rome Beauty," gave excellent results. It gives three times more yield than the local variety and the quality and color also are good. The raiyats are realizing the importance of this variety and are going in for it in large numbers. Every year we used to import about 1,000 plants from Australia, but during the last two years we have imported 10,000 plants



THE HORTICULTURAL SCHOOL,—VIEW SHOWING STUDENTS SPRAYING  
MANGO TREES AGAINST HOPPERS.



to meet the local demands. (All these plants are grafted on American Blight disease-resisting stock, the (Northern Spy). Improved methods of training, manuring and planting apples recommended by the Department are now profitably followed by growers.

The other fruits under trial are 120 varieties of mangoes and 75 varieties of Australian grapes. Among Australian grapes the following have given better yields both in quality and quantity :—(1) Gros Colman, (2) Muscat of Alexandria, (3) Black Hamburg. These are being largely grown for propagation.

Some of the tropical fruit trees that are introduced are :—American Butter Fruit, Cherimoyer, Bread fruit, Kew Pine Apples, Washington Papayas, Fegoa sellowiana, Sapodilla, Litchi, 50 new varieties of Bananas, Koko plum *Eugenia michellii* and Allahabad guavas.

**Fruit-preserving.**—In connection with the Horticultural School, experiments on preserving Mangoes and other fruits in syrup in Fowler's apparatus were tried and it was found that the fruits keep well for more than three years. It is proposed to hold short courses to teach household fruit-preserving.

In the half-yearly horticultural shows, one of the important sections is that of fruit. A large number of prizes are given to the exhibitors to encourage this useful and valuable fruit-industry for which this country is eminently suited.

### **Vegetable Cultivation.**

The centre of work in vegetable cultivation is the Horticultural Farm which was opened in 1910. The area of the Farm is 80 acres. This was formerly under a tank which was breached in connection with the Malarial operations and handed over to this Department for experimental cultivation. The whole area was graded, levelled, drained and made fit for cultivation and roads and plots were laid out. The farm depends for its water supply on the City sewage which runs through septic tanks built in the farm. There is a large Barn (40 feet by 70 feet) for drying and keeping the farm produce. The farm is doing very useful work in the cultivation of improved kinds of European and Tropical vegetables, fodders and economic plants. Among the new kinds of vegetables introduced are the following :—Maize, Golden

Beauty, Golden Dent, American Moro and Sugar Corn, Runner Beans (Kentucky Wonder), Canadian Wonder, French Beans, Butter Wad Beans, Lima Beans, Velvet Beans, Yams, Artichokes, Potatoes, Asparagus, Capsicums, Vegetable Marrows, Tomatoes, Sweet Potatoes, Cucumber, Brinjals, American Lady finger, Lettuce, Cabbage, Knol Kohl, Cauliflower, Beetroot, Carrot, Turnip, Parsnip, Radish, Leeks, Parsely, Celery and Spinach.

Maize is an important crop for food as well as fodder and is grown in rotation with potatoes and other garden crops. The area under this crop is more than 5,000 acres in the State. Out of about 30 varieties tried, the variety, Golden Beauty, imported from America, has given good results. This gives three times the yield obtained from the local variety ; every year about 10 acres are grown under this variety to meet the increased demand and it is already replacing the local variety.

The climate of Bangalore is well-suited for the cultivation of both local and European vegetables and as such the importance of scientific work in this direction cannot be under-rated.

### Economic Plants.

The following are some of the chief economic plants cultivated in the Botanic Garden and in the Farm :—

**Rhodes Grass** (*Chloris Virgata*).—This was introduced by this Department into the State as well as in India for the first time from Australia in 1910. The grass is liked by all kinds of stock and it forms good hay. About 500 acres are now under cultivation all round Bangalore. Ten acres are now under this crop at the Farm to meet the demand for seed. Under good cultivation we get 12 cuttings weighing over 2,00,000 lbs. per annum. This grass is now being cultivated in most of the Military Grass Farms. Other fodder grasses that were introduced are :—Guinea grass (*Panicum maximum*) and Elephant or Napier grass (*Pennisetum purpurium*). Hubam Clover (*Melilotus alba var. annua*) was imported from America. It gave an yield of 12,000 lbs. of fodder in 2 months. This enriches the soil with organic matter and is useful for agriculturists as the bees are very fond of these flowers.

Among other fodder plants are the following :—King Island Clover from Australia, Florida Velvet Beans, Mangelwurzels and Australian Salt Bush.

*Indigofera glandulosa* (*Befri*).—This is useful as a famine food and grows commonly as a weed in dry sandy tracts of the Deccan and Gujarat. It was imported in 1914 and large quantities of seed were distributed in the Districts for planting. In its wild state it is only a foot high and produces one-seeded pods but under cultivation it attains 2 to 3 ft. in height and gives double the yield and produces two seeded pods. Seed selection experiments are being conducted to get long podded variety to facilitate easy threshing. Chemical analysis shows that the nutritive value of *Befri* in its protein contents is over three times than that of wheat and also the energy value of carbohydrates is equal to that of wheat.

*Helianthes Annus* (**Giant Russian Sun Flower**)—This is an important fodder and oil-yielding crop in Russia. This was introduced in 1914. It yields at the rate of 5,440 lbs. of seeds per acre; every year 3 to 5 acres are grown for seed as there is a great demand, as this crop has become very popular for silage-making.

**Kachi Grass.**—This grass yields a valuable perfume which is largely used in mixing with other scents. This plant grows wild in the State. A survey was made in 32 Taluks in 1914 and it was found that there was enough grass in workable quantity to distil some 125 tons of oil. Distillation experiments were conducted. According to the primitive method of distilling, 100 head-loads or 10 maunds of fresh grass yields one kerosene oil tin which sells at Rs. 50 or at about Rs. 1-5-0 per lb. (taking a tin at 37½ lbs.). By distilling an equal weight of the flowers only and using proper stills, the same quantity of pure oil is obtained which fetches 6 shillings per lb. or Rs. 166-8-0 per tin. Realising the importance of the industry, a private syndicate is formed at Mysore which has taken up the distillation of this oil as well as of other perfumes such as Jasmine, Acacia Farnaciana, Rose, etc.

**Camphor.**—This is a very important economic plant. The oil and camphor contents were analysed and it was found that in our climate, the percentage of oil and camphor was more than that in Dehra Dun. Since 1908 more than 5,000 seedlings have been supplied to various agencies.

**Sisal hemp** (*Agave rigida* var *Sisalana*) produces a valuable fibre, chiefly used in binder twine industry. It is a suitable plant for dry tracts. Detailed experiments



were conducted in the extraction of fibre and it was found that this can be grown on a commercial scale profitably. Several lakhs of bulbils were propagated at Lal-Bagh and the Horticultural Farm and distributed to the public. There are several plantations in various parts of the State where the extraction of fibre is done by means of machinery and the planting of this fibre is on the increase.

**Pencil Cedar** (*Juniperus procerr*).—This is one of the valuable timbers used in the Pencil Industry. Several thousands of plants were supplied to various agencies including the Forest Department.

**Kapok** (*Eriodendron anfractuosum*).—This produces the valuable Silk Cotton of commerce and a large number of plants from selected seed have been introduced into the local cultivation. A great deal of work has been done during the past 15 years in the way of introducing, propagating and experimenting with numerous economic plants. In this short space mention can only be made of some of the most important ones besides those that are already described.

**Fibres**.—Manilla Hemp, Mauritius Hemp and Ramie or Rhea fibre.

**Rubbers**.—Cara rubber, Para rubber, Madagascar rubber, West African rubber, and Guayale rubber.

**Oils**.—Oil palm, Indian butter, Sunflower. The Chinese wood oil, Cajput, Wormwood, and Chalmugra.

**Perfumes**.—Lavender, Rose, Cassie, Cananga, Lemon grass, Rosemary and Caraway.

**Resins and Gums**.—Styrax Balsam, the Locust tree, Garcinia, Indian Copal, Gum-Arabic and Japan Lacquer.

**Dyes and Tans**:—Indigo, Logwood, Saffron, Divi-divi, Iron-wood, and Catechu.

As many of these economic plants are useful and suitable for growing on the large tracts of wasteland in the State, trial plantations and nurseries are now being opened in several of the dry areas and such plants as Prosopis, Cassia Farnesiana, Pongamia glabra, Ceratonia, Siliqua, Sterculea diversifolia, etc., are being made use of in this work with the object of furnishing fodder for cattle in famine times, green manure, food for bees, besides other uses such as scents, fibre, etc.

The cultivation of eatable Dates is being developed along with the above plantations.

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## CHAPTER XIII.

**Publications and the Agricultural Press.**

Realising that only a very small section of the people can be reached through the printed page in a country like Mysore, where literacy among the ryot classes is at a very low level and where even those who can read seldom resort to instruction from a book, the Department has not embarked upon that method of reaching the ryots to any large extent. As explained already, efforts have been concentrated on ocular demonstrations on the ryots' holdings. Nevertheless, the printed page has by no means been neglected, as will be seen from the list of publications issued by the Department from its inception, given in the appendix. The more salient features of this particular line of work may, however, be briefly indicated here to show the nature of the methods followed.

The *Coloured Poster* comes at the lowest rung of the ladder, as it is practically a cross between the printed discourse and the ocular demonstration. The use of green manure, the growing of Cambodia cotton, methods of collecting and conserving cattle manure, showing the right way and the wrong way, the *cumblihula* pest and combative measures against it, the keeping of good breeding bulls and stallions—these have formed the subjects of coloured and striking posters which have done duty at scores of villages.

The *Vernacular newspapers* in the State have been utilised for the publication of information, at different times, on subjects suitable to the season of the year. A large variety of subjects has been covered in this manner and these articles were prepared, translated into Kanarese and supplied to all the newspapers simultaneously.

The next higher step is the *Vernacular leaflet* illustrated wherever necessary and distributed from the depots of the Agricultural Inspectors. These are of more permanent interest and copies are always available and reprinted when the supply is exhausted.

The Board of Agriculture encouraged the publication of such leaflets by a small honorarium of Rs. 10 per leaflet to the writers. These leaflets were often written in both English and Kanarese.

*The Agricultural Calendar* is a yearly publication. The ordinary *panchanga* or almanac form is maintained but it is made the vehicle for a large mass of useful information on matters of agricultural improvement, principally relating to some of the recommendations of the Department. The *monthly notes* giving brief suggestions to attend to in regard to improved methods, month by month, is a particularly useful feature. During the 12 years that the calendar has now been running, the total number of articles published is twelve times that number. The price list of the implements and other materials stocked in the depots for sale is also published in the calendar. The calendar is published in English and in Kanarese and sold at a nominal price.

The *Journal of the Agricultural and Experimental Union* is a quarterly English publication edited by the Departmental officers. It is run on the lines of a first class Agricultural Journal, special attention being devoted to a record of the experimental work conducted by the members of the Union and to the results of scientific work that may be ready for publication. Papers read by the staff or lectures delivered are also issued as publications if thought suitable.

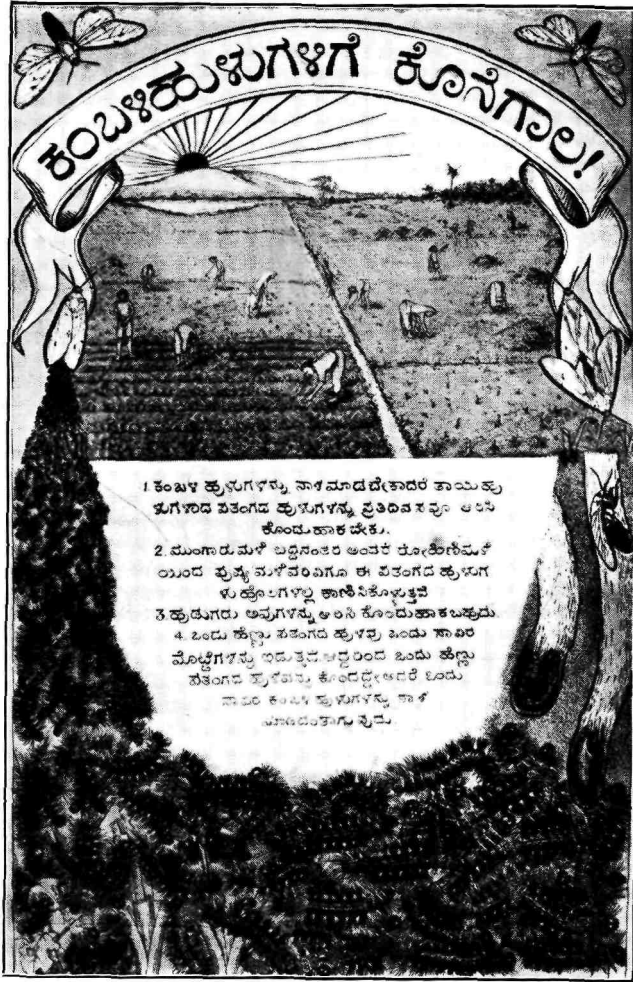
The *scientific publications and bulletins* of the department are issued when a *project* or line of experimental work pursued on a definite subject may have sufficiently advanced to admit of conclusions being drawn and recommendations made, or may be deemed fit for publication for other reasons.

In addition to these, in the years 1908-1914, the Annual Reports themselves were made to serve the purpose of departmental bulletins and besides summarising the work of the year, gave a great deal of useful information.

### **Publicity and Exhibitions.**

For a number of years, the Mysore Dasara Agricultural and Industrial Exhibition used to be held as an annual event in connection with the Dasara celebrations and the session of the Representative Assembly in Mysore City. The exhibitions were of a very elaborate character and the Agricultural Department of the State organised every year, a most striking and instructive display of all aspects of agricultural work. Each section was made as comprehensive as possible, with a view to imparting





PHOTOGRAPH OF COLORED POSTER ON THE  
 'CUMBLIHULA' PEST.

knowledge, mostly through *visual instruction methods*. A regular demonstration Farm was attached to the Exhibition, on which plots were laid out for manurial and varietal demonstration purposes and crops grown. A large variety of crops which the Department desired to bring to the notice of the people were grown and displayed *in situ*. Green manure crops, Cambodia cotton, tobacco of different kinds, sugar-cane of different varieties, indigo, senna and many other crops of economic value were also displayed growing. Model cattle stalls and manure pits were also constructed on the premises.

Every year, a display entitled "All about Sugar-cane" "All about Ragi," etc., was prepared in which the display of every feature, *e.g.*, soils, varieties, implements used, preparation of produce, etc., of each crop was arranged for by strikingly instructive exhibits, models, charts, actual specimens and so on.

The Chemical, Mycological, and Entomological Sections were organised in such a manner that not only was instruction imparted on the results of the work through models, pictures, charts and specimens, but the whole methods of investigations were themselves expounded through similar methods to give an idea of the accuracy and thoroughness called for in each investigation.

Daily demonstrations of agricultural implements actually at work, spraying of insecticides, milk analysis, cream separation and butter-making, exhibitions of lantern-slides and other fixtures were arranged, and altogether, the Exhibition was made to furnish as big a feast of knowledge as the resources and enterprise of the staff could afford. The Sericultural Department used to have a separate pavilion for itself, for demonstrations and exhibits illustrating the sericultural industry of the State and the improvements suggested.

*Conferences* are held annually at the District Headquarters, and at the Taluk Headquarters to review the district and taluk activities in economic development; in conjunction with these conferences agricultural exhibitions and demonstrations are held, some of which are organised like the Dasara Exhibition itself in miniature.

A very notable exhibition was a "*Cocoanut Show*" held in Tiptur by the Department in which every aspect of the cocoanut-palm with its multitude of uses formed the subject of display. The object was to bring before the cocoanut planters of this Taluk, which is the heart

of the cocoanut tract and its chief trading centre, in the most striking manner possible, the various uses to which the cocoanut tree and its products could be put. The coir trade of Cochin and Travancore were largely represented, as also cocoanut interests from Ceylon.

Special produce shows such as a groundnut show, a potato show, etc., are arranged as harvest festivals; and at these gatherings, all matters relating to improvements in the crop husbandry of these crops are made the subject of strikingly instructive displays. Soils suited, varieties to be grown, implements for ploughing, ridging, weeding, harvesting, grading methods, manures, bye-products, etc., are all illustrated and explained.

The Department of Agriculture has two competent artists on its staff whose services are fully made use of in the preparation of the charts, coloured posters and illustrative matter for the various publications as already described. In addition, *Magic Lantern slides* on a wide variety of subjects both of the classroom lecture order as well as of the village audience standard are prepared regularly and stocked for being made use of at these periodical shows and conferences.

These periodical shows are frequently organised by the Department, as part of its visual instruction methods of imparting information to the ryots and spreading a knowledge of improved agriculture.

## CHAPTER XIV.

**The Board of Agriculture.**

The Board of Agriculture, called formerly the Agricultural Committee, is one of the three Divisions of the Economic Conference organisation of the State. The functions of the Board are of a deliberative character at present, but in the earlier years when it was functioning as the Agricultural Committee, it undertook executive duties of various kinds in the districts, thereby in a measure supplementing and even duplicating the agency of the Agricultural Department proper. The Board is a permanent body and functions throughout the year, through its numerous sub-committees, its secretariat, its quarterly meetings and through its general annual session in conjunction with the sister Boards of Education and Industries. Every matter pertaining to the improvement of the agricultural prosperity of the State and of increasing the earning capacity and the well-being of the raiyat comes within its purview. The Board is expected to make a thorough study of the subjects it takes up, frame practical recommendations suited to the conditions of the State and submit detailed schemes for the sanction of Government and for being worked through the Agricultural Department or through the staff of the Board. At present, however, the Board has ceased to have any executive staff. The collection and collaboration of information regarding work on similar lines that is being carried on in the advanced countries of Europe, America and Japan, in order to stimulate interest among people in the State, was a special feature. Much store was also set on the compilation of correct estimates of production, agricultural statistics and so on, with the object of measuring progress from year to year. The Board deals with the factors of crop production and of rural betterment other than the purely technical or scientific subjects that are handled by the Department of Agriculture. It is really a co-ordinating organisation for ensuring action from many agencies to bring about the improvement of Mysore Agriculture.



The constitution of the Board at present is as shown below:—

CHAIRMAN.

First Member of Council.

MEMBERS.

- (1) The Director of Agriculture in Mysore.
- (2) The Chief Engineer in Mysore.
- (3) The Revenue Commissioner in Mysore.
- (4) The Live-Stock Expert in Mysore.
- (5) The Superintendent of Sericulture.
- (6) The Superintendent, Government Gardens, Bangalore.
- (7) The Registrar of Co-operative Societies in Mysore.
- (8) The Deputy Commissioner, Bangalore District.
- (9) A member elected by the Agricultural Union.
- (10) A member elected by the European Planting Interest.
- (11) A member elected by the Indian Planting Interest.
- (12) The Agricultural Chemist in Mysore.
- (13) The Conservator of Forests in Mysore.
- (14 & 15) Two members elected by the Representative Assembly.
- (16 & 17) Two members elected by the Legislative Council.
- (18) A Representative of Horticulture.
- (19) A Representative of Sericulture.
- (20) A Representative of Sugar-cane cultivation.
- (21) A Representative of Cotton cultivation.
- (22) A Representative of Areca and Pepper cultivation.
- (23) The Deputy Director of Agriculture (Co-opted).
- (24) The Entomologist to Government (Co-opted).
- (25) The Mycologist to Government (Co-opted).
- (26) The Superintendent, Civil Veterinary Department.

The Board has sub-committees on the following subjects:—

- (1) Rural Development.
- (2) Agricultural Education
- (3) Live-Stock.
- (4) Development of coffee, areca and cardamoms.
- (5) Development of sugar-cane, cotton and groundnuts.
- (6) Sericulture.
- (7) Horticulture.

The Board and its predecessor the Agricultural Committee have deliberated on a large number of subjects and matured practical schemes not all of which however have been given effect to, principally for reasons of financial stringency. The matters upon which practical action has been taken may be alluded to here.

Sericulture has engaged the attention of the Agricultural Committee from its inception and a great deal of constructive work was initiated and carried out. The work culminated in the establishment of the Department



THE MYSORE DASARA EXHIBITION,—VIEW SHOWING THE  
DEMONSTRATION PLOTS.

of Sericulture with its large organisation, its schools, farms, grainages, and filature and its record of important work.

Dairying and Live-Stock was another important matter on which the Committee successfully matured schemes and also controlled some amount of practical work, such as opening and managing a sheep farm, popularising of dairy machinery, the grant of loans for dairy farming and so on. The appointment of a Live-Stock Expert and the formation of a Live-Stock Section in the Agricultural Department was the outcome of the labours of the Committee.

Similarly, the Committee interested itself in Horticulture, brought into being a Horticultural School, appointed Horticultural Inspectors for introducing fruit cultivation in the districts, subsidised nurseries, and granted loans for the development of Horticulture and in many other ways encouraged Horticulture. In the work of the Agricultural Department also the Committee was eager to speed up progress and for that purpose was liberal with its funds for subventions for different kinds of work. Manure depots, the extension of sugar-cane cultivation, agricultural demonstrations and shows, the cultivation of tea, and camphor, forest and fuel plantations and a number of other subjects occupied its attention.

The Board of Agriculture has on its agenda many of the subjects, which were on the old agenda but on which no practical action has been taken. In addition, there is a large variety of other subjects also which have assumed importance since. The subjects assigned to the various sub-committees will give an idea of the wide scope of the work of the Board as shown below :—

<i>Sub-Committee.</i>	<i>Main subjects assigned.</i>
1 Rural Development Sub-Committee.	Consolidation of scattered holdings; formation of agricultural colonies; co-operative sale societies; co-operative societies as agencies and agricultural improvements; Land Mortgage Banks; development of subsidiary occupations; encouragement of honge plantations; utilisation of bye-products; inquiry into the economic conditions of selected villages; tank maintenance; improvement of Village Forests and Rural sanitation.
2 Agricultural Education Sub-Committee.	Popularisation of Agricultural knowledge; agricultural education of the elementary and secondary grades; sericultural education in rural schools.

*Sub-Committee.**Main subjects assigned.*

- |  |  |
|--|--|
| 3 Live-Stock Sub-Committee.                | Improvement of draught and milch cattle; improvement of sheep and goats; measures for increasing the supply of cross-bred rams to raiyats; pony-breeding; scheme for the supply of young Amrit Mahal Bulls to Village Panchayets; improvement of fodder supplies; introduction of the practice of ensilage-making; encouragement for the raising of fodder crops; prevention of epidemic diseases. |
| 4 Coffee, cardamons, etc., Sub-Committee.  | Establishment of a coffee bank, manuring of coffee, cardamon and areca; establishment of a coffee-curing house, encouragement of tea and rubber plantations.   |
| 5. Sugarcane, cotton, etc., Sub-Committee. | Supply of artificial manures, growers' associations, markets, production of copra.   |
| 6 Sericultural Sub-Committee.              | Formation of silk association; establishment of a conditioning house; development of markets for Mysore silk; supply of disease-free seed; sericultural co-operation; formation of mulberry topes.   |
| 7 Horticulture Sub-Committee.              | Extension of fruit cultivation and fruit canning; school gardens, starting of a central fruit nursery and orchard; cultivation of scent producing plants; cultivation of the edible date.  |
| 8 Special committee for manures.           | Consideration of the local manufacture of sulphate of ammonia; installation of small bone crushing mills; the question of prevention of export of bones; utilising spare power at Sivasamudra for the manufacture of Nitric Acid.  |

One of the most important branches of work of the Economic Conference directly bearing upon the development of agriculture was the scheme called the Village Improvement Scheme. Among the most tangible results of this scheme is the opening of village to village roads. Some hundreds of miles of such roads were opened which have greatly facilitated the movement of produce to the main highways from far off isolated villages. The difficulties of rural road transport were in a large measure solved, which has been of no small advantage from the standpoint of agricultural improvement.

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## CHAPTER XV.

**Summary and Conclusions.**

The foregoing chapters will, it is believed, have amply made clear the peculiar agricultural features of the Mysore State, its great advantages in soil and, climate, the great variety of commercial crops already grown, from coffee and cardamoms and pepper the money crops of the mountainous zone of torrential rains called the *Malnad*, through sugar-cane and mulberry the premier money crops of the State, down to the cocoanut, cotton, groundnuts, and tobacco of the plains and likewise the great volume and variety of its food grains, pulses and oilseeds. Mention has also been made of its celebrated breeds of oxen and its sheep, constituting the cattle wealth of the State.

The scope for and the main lines along which the improvement of this agricultural wealth of the State can be effected have been indicated. The bringing under cultivation of the vast areas still remaining to be developed by methods such as would enable the raiyat to own and farm a much larger holding than he does at present has been urged and the question of the introduction of improved implements and the question of putting large areas under plantations of perennial crops like coffee and tea in the *Malnad* and cocoanuts, tamarind, soapnuts, hongey and other valuable plantation crops in the *Maidan* have both been gone into. The great and all-important question of increasing the production and the money value thereof, on the vast areas already under cultivation, by the extension and improvement of irrigation, by the use of concentrated and other fertilisers on a very much larger scale than at present, by the growing of higher yielding varieties and by the displacement of part at least of the old crops by more profitable money crops, and by an intensive campaign against the numerous pests and diseases of the cultivated crops has been dealt with. The increasing of the profits of cultivation by cheaper and better cultural methods, by greater attention to the preparation of produce for market, and lastly by the safeguarding to the raiyat a larger share of the fruits of his labour by the prevention of exploitation by the money lender and the trader, through the agency of the

co-operative movement has also been discussed in broad outline. The question of the improvement in and the prevention of loss by mortality of the cattle and sheep and goats and other live stock of the State, has been dealt with, emphasising its importance as a subsidiary source of income to the raiyat. Particular stress has been laid on the importance and the improvement of the Silk Industry of the State and also of the importance of the cultivation of fruits, flowers and vegetables as subsidiary occupations of substantial money value. The nature and extent of State action and of the Departments thereof studying and actively engaged in bringing about improvements have been described and the nature of the results achieved and the programme of the various Sections of the Departments gone into in detail.

It is true that something by way of the introduction of a new crop or variety has been attempted now and again in the past, but it has little more than mere historical interest. Direct State action implying the new rôle of Government as an active agent in the introduction of improvements into the agricultural methods can be said to have been inaugurated only about 25 years ago. From very humble beginnings, it has been shown that the State Department of Agriculture has grown slowly but steadily, losing here and gaining there but expanding on the whole. The agency for the spread of agricultural improvements among the actual raiyats in the villages may be said to have been brought into existence only about 12 years ago, with the constitution of the District Staff, the Scientific Sections through their work in the Laboratory and on the Experimental Farms having accumulated sufficient material by way of specific recommendations to be taken out to the Districts in the meanwhile. The combination of most of the agencies, such as, the Civil Veterinary Department, the Amrutmahal Department, and the Sericultural Department with a view to greater economy and efficiency by putting them all under the control of the Director of Agriculture may be said to have been complete only as late as the year 1923.

It is needless to further refer to the work accomplished during the years except to indicate albeit as a rough approximation, the money value of these improvements. Sixteen thousand and odd improved tillage implements and the huge number of threshing rollers, improved sugar-cane mills and other improved appliances would account

for Rs. 12 lakhs. The improved varieties of ragi, sugar-cane and cotton, short-season groundnuts and paddy would account for Rs. 36 lakhs. The artificial manures and oil-cakes would likewise be credited with Rs. 15 lakhs and the saving due to remedial measures against pests and diseases for Rs. 30 lakhs. These then would amount in the aggregate to a sum of Rs. 87,00,000. Then there is the campaign against rinderpest which in this one year alone should have saved cattle of the value of Rs. 15 lakhs making up roughly a total money value of about a crore of rupees. There are again the improvements brought about by the work of the Sericultural section, which should be credited with a large and substantial amount.

The budget of the Agricultural Department for the current year is Rs. 6,29,700--which is divided between the main divisions as under:—

<i>Net Expenditure.</i>			
			Rs.
Direction	...	...	61,700
Chemical Section,	}	...	71,100
Entomological Section			
Mycological Section			
Botanical Section			
Agricultural Engineering	...	...	9,500
Farms including Implement Depot			
	Farms 37,700	}	40,500
	Implement Depot 2,800		
Agricultural Education	...	...	22,400
Demonstration and District Staff	...	...	1,07,800
Sericulture	...	...	68,100
Live Stock Section	...	...	35,200
Amrutmahal Department	...	...	33,500
Civil Veterinary Department	...	...	1,78,900

If we put this expenditure side by side with the figure given for the money value of the improvements relating to the current year, *viz.*, a crore of rupees, it will be seen how substantial is the return that is being obtained for the expenditure.

It is possible to contend as sometimes it is contended that all the abovementioned return does not imply any direct additional receipts into the Government Treasuries. It can only be pointed out in reply that the material prosperity of the raiyat is the foundation of the prosperity of the State and an increase in the one corresponds to an increase in the other. It is well to realise what is perhaps too obvious that every ton of increased produce means not only more food to the raiyat, more money in his hands to

purchase and pay, and thereby keep going the multitude of occupations depending on the raiyat, means increased profits to the merchants, and to the carrying trade of the country whether by rail or road, means more raw produce to the factories here or abroad, and above all means a happy and more contented raiyat. If the material welfare of the raiyat is the main concern of the State, and if the raising of his standard of life and of the condition of the Mysore village to the level of the urban conditions of the State and in the fulness of time to the level of the urban life of England or America, it can be accomplished only by increasing the raiyats' profits of farming and helping him to accomplish it for himself. That the money required for this purpose for the whole State can ever come out of the coffers of the State is almost impossible to contemplate.

What has been accomplished so far, substantial as it is, is little as compared with what can be and what has to be accomplished. Any material increase in the pace at which such a result can be secured can be chiefly through a large expansion of the staff of the Agricultural Department and a liberal allotment of money for the development of the work on the various lines indicated in the foregoing pages. This subject of increased staff and funds may appear too monotonous and insistent. It cannot be too well emphasised that the staff and the bulk of the work accomplished stand in direct relation of cause and effect in a large measure, especially where speeding up the work is required without leaving progress entirely to the effect of time. An instance is worth quoting to illustrate his point. Take the subject of artificial manures. Prior to the year 1914, it was not as if these were not known at all in the country. The Coffee Planters were importing them in large quantities; there were large bone-crushing mills in Hunsur and Bangalore; there were at least half a dozen large European Firms engaged in the trade. In the Laboratory of the Agricultural Department itself years of work were principally upon the analysis of fertilisers. And yet as far as the raiyat was concerned, little or nothing was being taken by him. Compare this picture with the state of affairs subsequent to 1914 when the sale of the artificial manures to *raiya*t runs into nearly 700 tons, while the oilcakes used by him run easily into thousands of tons. The change is nothing short of a revolution due solely to the work of the Department out



in the Districts. The desirability and urgency of the development of the work and agency of the agricultural and allied departments has not only to be adequately realised, but translated into action if the end in view has to be accomplished within a reasonable period of time.

This survey cannot be concluded more appropriately than with the following quotation from the Opening Address delivered by H. H. the Maharaja of Mysore at the Meeting of the Board of Agriculture of India which met in Bangalore in January 1924, as it is impossible to sum up the situation more accurately. His Highness said, "Gentlemen, when we look at the field that is open before you, when we consider the needs of Indian Agriculture, we must all of us be struck by the immensity of the task that lies ahead. The immense distance which lies between Indian Agriculture as it is and Indian Agriculture as it should be, calls for the most strenuous efforts you can put forward and for the most loyal support and recognition of your work on the part of Local Governments."

## APPENDIX II.

STAFF OF THE DEPARTMENT OF AGRICULTURE  
IN MYSORE, BANGALORE.

Leslie C. Coleman, M.A., Ph.D., Director, (on leave)  
 G. H. Krumbiegel, F.R.H.S., Offg. Director  
 H. V. Krishnayya, B.A., F.C.S., Headquarters Assistant to the  
 Director.  
 E. Rama Rao, Office Manager  
 N. S. Gopaliengar, B.A., Librarian

**Artists.**

M. Ranganayakalu Naidu, Senior Artist  
 S. Sadagopa Mudaliar, Assistant Artist

**Chemical Section.**

B. Narasimiengar, B.A., Ph.D., Agricultural Chemist  
 N. Sampathiengar, F.C.S., Senior Assistant Chemist  
 K. Bhima Rao, B.A., F.C.S., Senior Assistant Chemist, also Secretary,  
 Board of Agriculture, Economic Development Board.  
 B. Shankar Rao Badami, M.A., F.C.S., Senior Assistant Chemist  
 C. Yellappa Chetty, L.Ag., Junior Assistant Chemist  
 B. Krishna Murthi, B.Sc., Assistant Bacteriologist, working in the  
 Entomological Section.  
 S. Ramaswami Sastry, Analyst  
 M. Subbiah, B.A., Analyst  
 B. Dasappa, B.A., Analyst  
 G. Sundararaja Iyengar, Agricultural Inspector

**Mycological Section.**

M. K. Venkata Rao, M.A., M.Sc., Ph.D., Dip. Agri. (Cantab), F.L.S.,  
 F.R.H.S., Mycologist.  
 M. J. Narasimhan, B.A., Assistant Mycologist  
 S. V. Venkatroyan, B.A., Junior Assistant Mycologist  
 M. Krishna Murthy, Agricultural Inspector

**Entomological Section.**

K. Kunhi Kannan, M.A., Ph.D., Entomologist  
 T. V. Subrahmany Iyer, Junior Assistant Entomologist  
 B. C. Shantappa, Junior Assistant Entomologist

**Botanical Section.**

Venkata Rao, K. Badami, L.Ag., Senior Assistant Botanist  
 V. N. Ranganatha Rao, L. Ag., Junior Assistant Botanist  
 P. Jacob, Agricultural Inspector, Hebbal  
 D. Venkatramanaiya, Agricultural Inspector, Bahboor

**Experimental Section.**

- A. K. Yegnanarayana Iyer, M.A., Dip. Agri. (Cantab), N.D.D. (England),  
F.C.S., Deputy Director.
- D. G. Ramachandra Rao, Assistant Director, Shimoga
- B. Abdul Baisth Sheriff, Agricultural Inspector, Channapatna
- S. Krishna Rao, Agricultural Inspector, Kolar
- S. H. Bennur, L.Ag., Agricultural Inspector, Bangalore
- H. Venkoba Rao, Agricultural Inspector, Doddaballapur
- C. V. Ramayya, Agricultural Inspector, Tiptur
- M. S. Ramachandra Rao, Agricultural Inspector, Tarikere
- K. A. Krishnan, Agricultural Inspector, Tumkur
- K. Krishnamurthy, Agricultural Inspector, Hassan
- H. G. Hanumaih Chetty, Agricultural Inspector, Shimoga
- B. R. Gururaja Rao, Agricultural Inspector, Chikballapur
- S. V. Sharma, Agricultural Inspector, on Special duty
- T. D. Chayapathi, Agricultural Inspector, Chikmagalur
- S. Rangasamy, Agricultural Inspector, Mysore
- T. Krishnasamy, Agricultural Inspector, Maddur
- N. Venkatasubbiah, Rural Science Supervisor, Secretary, Mysore Agricultural and Experimental Union.
- M. Seshagiri Rao, Agricultural Inspector, Davangere
- B. Narasimha Murthy Rao, Agricultural Inspector, Chintamani
- |                           |    |                   |
|---------------------------|----|-------------------|
| K. Chayapathy,            | do | Coffee Experiment |
|                           |    | Farm, Balehonnur. |
| D. Balakrishna Rao,       | do | Nagamangala       |
| C. B. Krishna Murthy,     | do | Maddagiri         |
| K. H. Balaji Rao,         | do | Chitaldrug        |
| B. R. Gopala Rao,         | do | Implement Depot,  |
|                           |    | Bangalore.        |
| K. S. Ramachandra Murthy, | do | Hassan            |
- A. K. Narayana Murthy, Agricultural Inspector, Chamaraajanagar
- A. Venkataramayya, Agricultural Inspector, Head Master, Sri Krishna-  
rajendra Vyavasaya Dharma Pathasala, Chikkanahalli.
- K. V. Ramaswamy, Agricultural Inspector, Hole-Narsipur
- N. Srinivasamurthy, Agricultural Inspector, Challakere.
- K. Naranachar, Agricultural Inspector, Sagar
- C. V. Krishna Rao, Agricultural Inspector, Yedatore
- M. B. Ranganatha Rao, Agricultural Inspector, Tirthahalli
- K. Ramachandra Iyer, Agricultural Inspector, Holalkere

**Engineering Section.**

- M. G. Singrachar, B.A., A.C.E., Agricultural Engineer

**Agricultural School, Hebbal.**

- Gundappa S. Kurpad, B.A., Vice-Principal, also in charge, Hebbal Farm
- Arcot Devaraj, B.Ag., Agricultural Inspector, in charge of Hebbal Dairy.
- D. Hanumanthiya, B.A., B.Ag., Teacher

**Farms.**

Gundappa S. Kurupad, B.A., Vice-Principal, in charge  
 T. D. Chakrapani Mudaliar, Assistant Farm Manager  
 Sheik Ansir, Agricultural Inspector

**Babboor Farm.**

K. M. Gururaja Rao, L.Ag. Farm Manager  
 D. Srikantiah, Agricultural Inspector  
 N. Ramanna, B.Ag., Agricultural Inspector

**Nagenahalli Farm.**

P. Ramaswamiengar, Farm Manager  
 D. Venkataramanayya, Agricultural Inspector

**Marthur Farm.**

S. Daniel, L.Ag., Agricultural Inspector, in charge  
 M. Vasudeva Murthy, B.Ag., Agricultural Inspector

**Balehonnur Coffee Experimental Station.**

D. Gundu Rao, B.Sc., Farm Manager  
 K. Chayapathy, Assistant Farm Manager

**Live-Stock Section.**

Lt. A. A. Monteiro, Officer in charge  
 B. Lakshmipathy, Veterinary Assistant, Hebbal (on deputation to Rayankere Dairy Farm)  
 P. Shama Rao, Veterinary Assistant, Hebbal  
 C. Narasingaraju, L.Ag., Agricultural Inspector, Secretary Kolar Sheep-Breeders' Association  
 Y. R. Narayana Rao, Agricultural Inspector, Kolar Sheep Work  
 H. Shankaranarayana, Yelechihalli Sheep Farm  
 R. Narayana Iyer, Agricultural Inspector, Chemical Section  
 H. Srinivasadass, Agricultural Inspector, on leave  
 H. M. Subbaya, Agricultural Inspector, Rayanakere Dairy Farm

**DEPARTMENT OF SERICULTURE.**

N. Rama Rao, B.A., B.L., Superintendent of Sericulture in Mysore  
 V. M. Appadorai Mudaliar, Filature Superintendent  
 K. Shamsuddinkhan, B.A., Senior Inspector, Mysore  
 H. S. Govinda Rao, B.A., Senior Inspector, Mysore  
 E. S. Ramanathan, Senior Inspector, Kunigal  
 K. P. Ramaiah, First Class Inspector, Kolar Farm  
 M. S. Muthanna, First Class Inspector, Holenarsipur Farm  
 B. Suryanarayana Rao, Second Class Inspector, Kolar Farm  
 M. Syed Yabia, Second Class Inspector, Mysore Farm

H. S. Venkatesa Iyer, Second Class Inspector, Channapatna Farm  
 K. Sibgathulla Sheriff, Second Class Inspector, Kolar Farm  
 M. Narayanasami Gowda, Second Class Inspector, Mysore Farm  
 T. Lingachetty, Second Class Inspector, Filature Assistant, Mysore  
 A. Shivalingappa, Second Class Inspector, Sidlaghatta Farm  
 C. R. Sivarama Prasad, Second Class Inspector, Channapatna Farm  
 T. Shamanna, Second Class Inspector, Mysore Farm  
 T. Puttanna, Second Class Inspector, Hindiganal Farm  
 K. Mahomed Ghose, Second Class Inspector, Nagamangala  
 G. V. Amble, Second Class Inspector, Bidadi Farm  
 B. R. Iyengar, Second Class Inspector, Babboor Farm  
 C. N. Badappa, Second Class Inspector, Hebbur, Kunigal Range  
 M. Abdul Whab Khan, Second Class Inspector Channapatna  
 H. Guruputra, Second Class Inspector, T.-Narsipur Farm  
 H. V. Nanjappa, 2nd Class Inspector Kunigal  
 S. Srirangamma, do Channapatna  
 N. Rangamma, do Mysore Farm

#### Temporary Staff.

N. R. Krishna Murthy, B.A. Senior Inspector, for Co-operative Work,  
 Channapatna.  
 H. R. Gundappa, 2nd Class Inspector, Arkalgud

#### CIVIL VETERINARY DEPARTMENT, BANGALORE.

Major R. W. Simpson, M.C., G.B.V.C., Superintendent (on leave)  
 K. Krishna Iyengar, G.B.V.C., Acting Superintendent  
 S. D. Achar, G.B.V.C., Acting Assistant Superintendent, Western  
 Division, Shimoga.  
 K. N. Srinivasan, G.B.V.C., Ag. Assistant Superintendent, Shimoga  
 B. V. Venkatachar, G.M.V.C., Veterinary Officer, Bangalore  
 C. Narayana Iyengar, G.B.V.C., Acting Veterinary Officer, Mysore  
 R. M. Patankar, G.M.V.C., Veterinary Inspector, Hassan  
 N. Krishna Iyengar, G.B.V.C., Veterinary Inspector, Tiptur  
 N. R. Srinivasa Iyengar, G.B.V.C., Veterinary Inspector, Tumkur  
 G. Subrahmanya Iyer, G.B.V.C., do Maddagiri  
 L. V. Sallam Iyengar, G.B.V.C., do Officer, Palace, Mysore  
 M. Sundararajengar, G.B.V.C., do Inspector, Chitaldrug  
 C. Ranganna, G.B.V.C., do Sakalespur  
 (one on deputation to Lahore Veterinary College for Post-  
 Graduate Course)  
 N. Krishna Murthi, G.B.V.C., Veterinary Inspector, Mobile Corps  
 P. Ukundanair, G.B.V.C., do do  
 (on deputation to Muktesar.)  
 K. Ranganatha Rao, G.B.V.C., do do  
 M. V. Ramaswamy Naidu, G.B.V.C., Veterinary Inspector, do  
 (on deputation to Lahore Veterinary College for Post-Graduate  
 Course)  
 M. R. Kenchiah, G.B.V.C., Veterinary Inspector, Bangalore  
 H. B. Kulkarni, G.B.V.C., do Channagiri  
 T. Chandu, G.B.V.C., do Channapatna  
 T. V. Venkatachallam, G.M.V.C., do Arsikere  
 C. S. Prabhakar, G.B.V.C., do Mudgere

P. K. Shama Rao, G.B.V.C.,	Veterinary Inspector,	Devangere
K. N. Kailasam, G.M.V.C.,	do	Hunsur
B. Sheik Peer, G.M.V.C.,	do	Chintamani
P. Aswatha Sastry, G.B.V.C.,	do	Challakere
G. V. Ramiah, G.B.V.C.,	do	Kolar
C. Nanjundiah, G.B.V.C.,	do	Nagamangala
V. S. Raja Gopala Mudaliar, G.B.V.C.,	do	Mobile Corps
G. Narayana Murthy, G.B.V.C.,	do	do.
K. Srikantiah, G.B.V.C.,	do	do
Syed Yusuff, G.B.V.C.,	do	Malvalli
V. Jagannatham, G.M.V.C.,	do	Shimoga
B. S. Kalyanasundaram, G.B.V.C.,	do	Sagar
M. Subba Rao, G.M.V.C.,	do	Mobile Corps
B. Venkatesayya, G.B.V.C.,	do	Dodballapur
B. Somasundaram Pillay, G.M.V.C.,	do	Mobile Corps
M. Srikantiah, G.B.V.C.,	do	do
Syed Nuruddin, G.M.V.C.,	do	Tarikere
K. Krishna Murthi, G.M.V.C.,	do	Mobile Corps
S. Narayana Rao, G.M.V.C.,	do	Arkalgud
P. C. Adakalam, G.M.V.C.,	do	Chikmagalur
V. S. Kuppasami Mudaliar, G.M.V.C.,	do	Mobile Corps
R. M. Purushotham Naidu, G.B.V.C.,	do	Saklespur
K. R. Ramchandra Rao, G.B.V.C.,	do	Saklespur
K. S. Gopal Rao, G.M.V.C., Temporary,	do	Chikballapur
H. N. Dorasamiengar, G.M.V.C.,	do	Mobile Corps

#### Temporary Veterinary Inspectors.

C. R. Narayana Iyer, G.M.V.C.,	Veterinary Inspector,	Mysore
A. D. Samuel, G.M.V.C.,	do	Mobile Corps
G. Dandayudapani, G.M.V.C.,	do	do
Syed Meigh Sahib, G.M.V.C.,	do	do
Syed Masum, G.M.V.C.,	do	do
K. S. Vanniperumal, G.M.V.C.,	do	do
E. Dias, G.M.V.C.,	do	do
Kallapan, G.M.V.C.,	do	do
Venkatasastry, G.M.V.C.,	do	do
E. Sankunni Nair, G.M.V.C.,	do	Mysore
Subrahmanyam, G.M.V.C.,	do	Mobile Corps
Krishnab Numbiar, G.M.V.C.,	do	do
Hayath Sheriff, G.M.V.C.,	do	do
Krishnasami, G.M.V.C.,	do	do
Janardhana Iyer, G.M.V.C.,	do	do
Venkatraman, G.M.V.C.,	do	do

#### AMRIT MAHAL DEPARTMENT.

Lt. A. A. Monteiro, Offg. Superintendent.  
 S. P. Seshagiri Rao, G.B.V.C., 1st Grade Daroga, Chitaldrug.  
 Mahomed Khan Miyana, 1st Grade Daroga, Hassan.  
 T. J. Narasaja Rao, 2nd Grade Daroga, Hunsur.  
 S. K. Venkata Rao, 3rd Grade Daroga, Kadur Range, Birur.  
 N. D. Venkatakrishnaya, 3rd Grade Daroga, Tiptur Range.  
 D. R. Kalappa Naidu, Offg. 3rd Grade Daroga.  
 Ramanna, 1st Grade Assistant Daroga, Tumkur Range, Gubbi.

## APPENDIX III.

MONTHLY RETURN OF WORK DONE BY THE  
AGRICULTURAL INSPECTOR.

for.....192 .

(To be submitted within a week after the end of the month  
to which it relates.)

No. of days on tour.

No. of villages visited.

No. of Demonstrations held.

No. of Ploughings.

Cultivating.

Jaggory-boiling, complete.

Do use of ladles, litmus, etc.

Single seedling.

Roller threshing, threshing machine.

Seed selection (salt water, Ear head selection).

Steeping jola in copper sulphate.

Implements sold—Ploughs { Kind  
No.

Cultivators.

Harrows.

Shares.

Sugar-cane mills.

Sugar-cane pans and jaggory-boiling accessories.

Sugar-cane moulds.

Skimming ladles.

Cream separators.

Butter churns.

Dairy accessories.

Stone rollers.

Chaff cutters.

Gardening tools.

Chain pumps.

Winnowers.

Threshing machines.

Others.

Seeds supplied—Paddy.

Jola.

Ragi.

Sugar-cane setts.

Turmeric.

Cotton { Variety.  
Amount.

Groundnut.

Vegetable seeds. (Value).

Green manure seed. { Kind.  
Quantity.

Indigo.

Others.

**Manures**—Oil-cake.

Bonemeal.

Sulphate of Ammonia.

Superphosphate.

Special mixtures.

Other artificials.

Jola steep—Number of packets.

Meetings attended and addressed:—

Meetings of Taluk Progress Committees.

Do District Committees.

Do Jatras, Santes, etc.

Number of visitors to depot.

Number of leaflets, etc., distributed.

Amount of sales remitted:—

Implement Depot.

Oil-cake advances.

Seeds and manures.

Implements, etc., hired out.

Miscellaneous.

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Total.

Work done--Single seedlings planted (acres).

Salt water selection (seers and acres)

Silo pits dug.

Other work done.

*Date**Camp**Agricultural Inspector,**Dt.*

**NOTE:—**(1) Sales to or through Co-operative Societies and other organizations should be shown separately in red ink.

(2) Any other remarks that the Agricultural Inspector wishes to make should be written on the reverse.

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**APPENDIX IV.****PUBLICATIONS OF THE DEPARTMENT OF AGRICULTURE IN MYSORE, BANGALORE.****SERIAL  
No.****Subject.**

1 to 11. Annual Reports of the Agricultural Chemist from 1899 to 1910.

12 to 26. Annual Reports of the Agricultural Department from 1910 to 1925.

27 to 38. Mysore Agricultural Calendars for the years 1915 to 1926  
(English).

39 to 50. Do do (Kannada).



**BULLETINS.****General Series.**

51. Green Manuring in Mysore (English and Kannada).
52. Experiments on Paddy Cultivation (English and Kannada).
53. Report on Agricultural Education.
54. Report on Agricultural Tours in Europe, America and Japan during 1912-13.
55. Short Report of the Mysore Agricultural Department (English and Kannada).
56. Coffee: Its Cultivation and Manuring in South India (English and Kannada).
57. A note on the Milk Supply of Bangalore (In English only).
58. Prospectus of the Chikkanhalli Agricultural School.
59. Methods of Butter-making, Local and Improved.
60. Cultivation of the Areca Palm in Mysore.
61. The Cultivation of Ragi in Mysore. (English and Kannada).

**Chemical Series.**

62. Some Manurial Earths of Mysore (*Boodi Mannu*) (English and Kannada).

**Mycological Series.**

63. Ring Disease of Potatoes.
64. Diseases of the Areca Palm. I. Koleroga. (English and Kannada).
65. Spike Disease of Sandal (English).
66. Proceedings of the Conference on the Spike Disease of the Sandal.
67. Black Rot or Koleroga of Coffee in Mysore. (English). |

**Entomological Series.**

68. The Rice Grasshopper (English and Kannada).
69. Jola or Deccan Grasshopper (English and Kannada).
70. Kamblihulas attacking crops in Mysore.
71. Some Scale Insect Pests of Coffee (English.)
72. Ground Beetles attacking crops in Mysore.
73. Pulse Beetles
74. The Function of the Prothoracic Plate in Mylabrid (*Bruchid*) Larvæ, (A study in Adaptation) in English only.

**Circulars.**

75. Koleroga of Supari in Kannada and English.
76. About Grasshopper in English and Kannada.
77. Koleroga of Supari (English and Kannada.)
78. Directions for taking Samples of Soils and Manures, (in English and Kannada.)
79. Broach and Cambodia Cotton (in Kannada only.)

80. Agricultural Implements and Machines (in English.)
81. Green Bug on Coffee (in Kannada only.)
82. Distribution of Broach Cotton Seed to the Cultivators during the year 1913 (Kannada only.)
83. Distribution of Cambodia Cotton Seeds (in Kannada only.)
84. Smut on Jola, (in English and Kannada.)
85. A use of Hongey Oilcake as Manure to Sugar-cane (in Kannada only.)
86. Price List of Implements sold in the Implement Depot of the Department, (in English only.)
87. Selection of seeds by Salt Water Method (in Kannada only.)
88. Koleroga of the Areca Palm, (in English only.)
89. Kamblihulas attacking crops in Mysore (in Kannada only.)
90. Kondlihula of Castor (in Kannada only.)
91. Kokkareroga of paddy (in Kannada only.)
92. Handbook of Exhibits, Mysore Dasara Exhibition, 1917 (in English only.)
93. How to Combat Coffee Borer.
94. Kamblihula, (in Kannada only.)
95. The drying of Arecanuts (in English only.)
96. Kamblihula with Black Head (in Kannada only.)
97. Insect Pests of Earhead of Gidda Ragi (in Kannada only.)
98. Methods of Cultivating Summer Season Crop, (in Kannada only.)
99. Methods of Cultivating Ragi (in Kannada only.)
100. Methods of Cultivating Bilijola and Navane (in Kannada only.)
101. Methods of Cultivating Short Duration of Paddies (in Kannada only.)
102. Borer Hula (in Kannada only.)
103. List of Books available for Lending from the Library of the Department of Agriculture in Mysore. (English only.)
104. Cattle-breeding (in English and Kannada.)
105. Pony-breeding (in English and Kannada.)
106. Transplantation of paddy (in Kannada only.)
107. Kamblihula Pest Act (in Kannada only.)
108. Ragi (Eleusine Coracana) Varietal Tests (in English and Kannada.)
109. Groundnuts (Arachis Hypogea) Trials. (English and Kannada.)
110. Castor (Recinus Communis) Trials.
111. Sugar-cane Varietal Tests.
112. Manufacture of Ensilage. (English and Kannada.)
113. Prickly-Pear as a Fodder for Cattle. (English and Kannada.)
114. Lime Tree Borer, (Kannada only.)
115. Sugarcane Borer. (Kannada only.)
116. Jola Grasshopper, (Kannada only.)
117. The Improvement of Indian Dairy Cattle.
118. Harvesting Groundnuts—A New Use for the Stone Threshing Roller.
119. A Century and a Quarter of Mysore Agriculture—A Retrospect.
120. A Note on the Consolidation of Holdings in Mysore.

*The Mysore Agricultural and Experimental Union.*

- 120-152. The Journal of — for the years from 1918 (Published Quarterly.)

## SERICULTURAL SECTION.

*Kannada Bulletins.*

- 153. Plans of Stands and Trays for new rearing houses in Mysore.
- 154. Defects in current methods of rearing Silk-worms in Mysore by Mr. M. Yonemura.
- 155. Things which a Silk-worm rearer should know.
- 156. Sericulture as a subsidiary occupation.
- 157. What is meant by "Good Silk"? by Mr. N. Rama Rao.
- 158. Sericulture, by Mr. V. M. Appadorai Mudaliar.
- 159. Sericulture, by Mr. M. V. Gopalakrishnan.
- 160. Sericulture in Mysore by Signor Mari.
- 161. Sericulture in Kolar District.
- 162. The Silk Industry of Japan, by Mr. N. Rama Rao, B.A., B.L.
- 163. Sericulture Co-operative Societies, by Mr. N. Rama Rao.
- 164. Sericulture and Local Boards, by Mr. N. Rama Rao.
- 165. Matters to be borne in mind when rearing silk-worms of new races by Mr. H. S. Govinda Rao.

*English Bulletins.*

- 166. *Sericulture in Japan*, by Mr. N. Rama Rao, B.A., B.L.
- 167. *Sericulture in Mysore*, a lecture by Dr. G. Gorio.
- 167A. The Silk Industry of Japan and its Administration by the Government.
- 168. Disease among Silk-worms in Mysore.
- 169. Silk Expert's Report on his rearings of Silk-worms at Channapatna (1919-20).
- 170. Instructions and Rules for Government grainages.
- 171. Sericultural Co-operation.
- 172. Instructions for the disinfection of rearing houses and appliances.
- 173. Grainage Chart Books.
- 174. Notes on the disinfection of rearing rooms and appliances.
- 175. Scheme of Organisation by Washington Mari.
- 176. Report on the rearing of Univoltine worms during February and March 1920, at Kolar.
- 177. Report on the rearing of Univoltine worms during February and March 1920, at Mysore.
- 178. Report on the rearing of Univoltine worms during February and March 1920, at Sidlaghatta.
- 179. Rearings of Univoltine worms (Kashmir and Europe) at Kolar.
- 180. Manurial experiments conducted in the mulberry garden at Channapatna during 1917.
- 181. Signor Mari's Reports of the Channapatna Farm.

*Hindustani Bulletins.*

- 182. Silk Expert's Report on the rearing of the Silk-worm at Channapatna.
- 183. Sericulture as a subsidiary Industry.
- 184. Instructions for rearing New Races of Silk-worms.
- 185. What is meant by good silk?
- 186. The Silk Industry of Japan.
- 187. Defects in current methods of rearing Silk-worms in Mysore.

# MAP OF THE MYSORE STATE

Showing Centres of work of the Department of Agriculture.

- Central Office, Scientific Laboratories and Central Implement Depot.
- ▣ Experimental Farm.
- ▤ Implement Depot and Head Quarters of Agricultural Inspector.
- ▥ Agricultural School.
- ⊕ Deputy Director's Office.
- ⊙ Assistant Director's Office.
- Sheep Farm.
- ▲ Dairy Farm.
- ▽ Government Veterinary Hospital and Dispensary.
- ▷ Sericultural Head Quarters.
- △ Do Central Farm with Grainage and Schools attached.
- ◇ Do Farm.
- △ Amrit Mahal.

